Final report

PDS: Reproductive Health and Management Practices for Beef Heifers

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Abstract

This Producer Demonstration Site (PDS) project aimed to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving. It was set up to link in with the University of Adelaide's MLA funded research and development project B. GPB.0038, '*Optimising heifer development and management to increase whole herd productivity*,' to achieve a faster rate of on-farm adoption of scientific research.

Within the three-year project, 19 participating beef businesses, representing around 18,600 breeding cows across 49,000 ha of farmland within the Limestone Coast region of South Australia, monitored their 2020 drop heifers in relation to liveweight, body condition score, animal health and reproductive rates from weaning through to second calving in 2023.

Twelve interactive, technical sessions were conducted across eleven host properties from within the group. With a strong emphasis on industry collaboration and interaction between researchers, veterinarians, livestock advisers and peer-to-peer learning, producers within the group increased their knowledge by 19% (from 66% to 85%) and increased their skills and confidence for managing their breeding herd for improved health and reproduction by 13% from 65% to 78%.

Benefits to the wider Southern beef industry have included the development of extension articles, producer case studies, podcasts, and videos. This group will continue to provide a platform for R&D producer consultation and extension, as well as providing mentoring opportunities for early career livestock consultants for a further three years as a dedicated beef discussion group.

Executive summary

Background

At the time of project initiation in 2021, there was a significant lack of beef extension services within SA. This was in stark contrast to a vast number of extension and adoption programs targeting sheep producers, in particular the successful "Lifetime Ewe Management" program.

An initial survey of 15 beef producers, located in the Limestone Coast region, indicated a strong interest and enthusiasm to form a dedicated beef producer group. It was evident from feedback from producers surveyed, that there were some common issues impacting negatively on animal health and reproductive efficiency in businesses across the region. Without clear industry recommended guidelines or targets for reproductive success in beef cattle and a lack of technical beef extension support services within the region, producers were finding it difficult to work out what beef animal health and management practices should be adopted within their beef cattle enterprises. This group of producers were eager to adopt best practices guidelines, along with collecting on-farm data to assess the effectiveness and practicality of guidelines for animal health and management practices to improve the reproductive efficiency and profitability of their herds.

The purpose of the project was to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving, by understanding and adopting best practice monitoring and management practices for animal health, condition scoring and nutritional management.

To facilitate a faster rate of adoption, linkage with the MLA R&D project B.GPB.0038, '*Optimising heifer development and management to increase whole herd productivity,'* enabled numerous extension opportunities from this current relevant research that was being done in the region. The data collection aspects and methodology of this PDS and the R&D project B.GBP.0038 ran in parallel, with results of the R&D project being adopted by producers in real-time to see the impact on their production systems, rather than having to wait until the completion of the R&D project.

Through this collaborative model, producers successfully built their knowledge and skills to assist them to optimally manage their breeding heifers through to second calving.

Objectives

The main objective was to optimise the reproductive potential of heifers through to second calving, and improve cattle herd health, welfare, productivity, and profitability. This was successfully achieved with an increase in the percentage of heifers achieving 'WAPE' (defined as joined heifers successfully getting in calf and getting back in calf within the first six weeks of their second joining). Only 48-57% of heifers within baseline data had achieved WAPE compared to 62% in the monitor mob, with further increases likely in subsequent heifer drops.

An overarching aim of the project was to increase southern beef productivity growth through an increase in producer capacity and skills to apply R&D outcomes to their farming operations, as well as through the implementation of 'best-practice' management systems to improve the productivity and profitability of beef enterprises within the Limestone Coast region of SA.

This objective was achieved successfully with participants increasing their overall knowledge and skills score from 66% to 85% and their overall confidence score from 65% to 78%. Final Knowledge Attitude Skills Aspiration (KASA) surveys showed participants confidence levels around 80% for: Body Condition Score (BCS) assessment, managing herd according to nutritional requirements, assessment

of pasture quality and quantity, managing reproductive and metabolic diseases in the herd, and using BREEDPLAN EBV's to select bulls to lift herd productivity. They also had 89% confidence in managing parasites (including worms) in the herd.

Methodology

A group of 32 producers, representing 19 participating beef businesses with 18,600 breeding cows across 49,000 ha of farmland within the Limestone Coast region, have been involved in the Beef PDS discussion group between December 2020 and December 2023.

Ten of these producers (representing 5,330 breeding cows) monitored the liveweights and BCS of their 2020 drop heifers, joined in 2021 to calve as heifers in 2022 and as second calvers in 2023. All businesses within the group were encouraged to have a monitor mob (2020 drop heifers) to follow from weaning to second calving, and record reproduction results throughout the three-year project.

The group met in person a total of 12 times over the course of the project and visited 11 host properties from within the group (Target=7 host properties and 3 technical sessions with industry / veterinary expert).

At each session, producers practiced body condition scoring and pasture assessment, along with discussing the nutritional requirements of the different classes of cattle within the group.

With a strong emphasis on peer-to-peer learning, as well as support from a team of technical experts, livestock consultants, veterinarians, and industry representatives, technical sessions have included understanding genetics and bull selection to meet a breeding objective, hybrid vigour, metabolic and animal health conditions, bull structure and fertility assessment, tips for assisting difficult calving, calf post-mortems, treatment of calf scours, logistics of artificial insemination (AI), pregnancy scanning and foetal aging, discussions of calving times and management systems within the group, understanding the profit drivers of the beef enterprise, partial budgeting and marketing.

Over the course of the project, an additional 90 people have been engaged in the project through attendance at wider engagement events of the Mackillop Farm Management Group (MFMG) livestock field days. Of these extras, 76 were producers and the remaining 14 were either livestock advisers, veterinarians, or researchers.

Results / key findings

Considerable progress was made in assisting producers build their knowledge and skills to meet the nutritional requirements of their breeding females to achieve optimum reproductive performance and set up for subsequent joining's.

Heifer conception rates of 2020 drop heifers remained similar to baseline levels (81% compared to 80% in 2019 drop heifers), however, an increase in heifer conception rates was seen in 2021 drop heifers to 84%. Additionally, there was a reduction in heifer mortality from 2.7% to 0.6% as well as a reduction from 13% to 4% of heifers needing assistance at calving. Re-conception rates of the 2020 drop animals as second calvers increased from 88% (baseline) to 92%, with the cow mortality in second calving cows reduced slightly from 0.2% to 0%.

The collaborative model between research, industry and advisors within this project has demonstrated to participants the value of ongoing animal health, nutrition, and pasture agronomy advice with several taking the opportunity to work with livestock consultants and veterinarians one-on-one, outside the formal group setting.

Extension and communications have included:

- a website project page: https://www.mla.com.au/extension-training-and-tools/search-pds/pds-data/reproductive-health-and-management-practices-for-beef-heifers/
- 5 in-depth articles.
- 4 podcasts: https://www.mackillopgroup.com.au/the-prosperous-farmer https://www.mla.com.au/extension-training-and-tools/search-pds/pds-data/reproductive-health-and-management-practices-for-beef-heifers/
- 6 videos: https://www.youtube.com/@MacKillopGroup/featured
- 1 presentation at a national MLA event.
- 14-15 social media posts.

Monitoring, evaluation, and reporting (MER):

- Pre-KASA surveys were returned by 24 produces from 19 businesses.
- Post-KASA surveys returned by 19 producers from 13 businesses.
- 91% overall satisfaction with the content of the project.
- 86% was the value of the project reported by producers in assisting them in managing their beef enterprises.

Benefits to industry

This project has already contributed significantly to the development of another beef producer extension project with an application submitted to MLA on "*Profitable and resilient Southern Beef herds (MBfP 2.0)*." The group, developed within this project, will continue as a dedicated beef discussion group for a further three years and will provide a platform for R&D producer consultation and extension, as well as enabling mentoring opportunities for early career livestock consultants. The network of livestock consultants, veterinarians and beef producers within this project will continue to share with industry the valuable insights and lessons learned from this successful extension and adoption project.

Future research and recommendations

- An important enabler for adoption is excellent facilitation to create open and transparent discussions, built on trust and sharing of the good, bad and the ugly, as well as the provision of a supported learning environment with access to researchers, technical experts, and veterinarians.
- Practical on-farm sessions are an important source of peer-to-peer learning and drive the adoption of more investigative approaches to solve management issues.
- The linked heifer reproduction R&D project describes 'WAPE' as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of joining. Since most producers only select a portion of their heifer weaners to join, the recommendation is that the percentage achieving WAPE should be assessed from the numbers of heifers at joining (not weaning) through to second calving.
- One of the questions that hasn't been fully answered within this project is whether increasing heifer conception rates to 88-90% actually translates into an increase in profitability or not. Further work needs to be done in this area to model the impact of beef reproduction rates on the profitability of beef enterprises.

PDS key data summary table

Project Aim:
To optimise the reproductive potential of heifers through to second calving, and improve cattle herd health, welfare, productivity, and profitability.

	Comments		Unit
Production efficiency benefit (impact) Reproductive efficiency – marking %, weaning % Mortality rate (%)	- Heifer conception rates of 2020 drop heifers remained similar (81% compared to 80% in 2019 drop heifers). - An increase in heifer conception rates was seen in 2021 drop heifers to 84%. - 2020 drop heifer calving data showed a reduction in heifer mortality from 2.7% to 0.6%, as well as a reduction from 13% to 4% of heifers needing assistance at calving. - An increase in re-conception rates of 2020 drop animals as second calvers from 88% (baseline) to 92% was recorded.		
Net $ benefit (impact)		**$0**	**/ha**
Number of core participants engaged in project		32	
Number of observer participants engaged in project (metrics reported in separate sessions)		90	
Core group no. ha		49,000	
Core group no. cattle (breeders)		18,600	head cattle
Core group no. sheep (breeders)		50,000	head sheep
% change in knowledge	66% to 85%	19%	
% change in skill & confidence	65% to 78%	13%	
% change in skill & confidence BCS	61% to 83%	22%	
% change in skill & confidence managing herd according to nutritional requirements	65% to 79%	14%	
% change in skill & confidence assessing pasture quality and quantity	65% to 82%	17%	
% change in skill & confidence managing reproductive and metabolic diseases	63% to 79%	16%	
% change in skill & confidence managing parasites	65% to 87%	22%	
% change in skill & confidence using BREEDPLAN EBV's to select bulls	71% to 82%	11%	
% practice change adoption – see Table 50.			

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1. Background

1.1 Lack of beef extension and adoption services in the region

At the time of project initiation in 2021, there was a significant lack of beef extension services within SA. This was in stark contrast to a vast number of extension and adoption programs targeting sheep producers, in particular the successful "Lifetime Ewe Management" program.

An initial survey of 15 beef producers, located in the Limestone Coast region, indicated a strong interest and enthusiasm to form a dedicated beef producer group. It was evident from feedback from producers surveyed, that there were some common issues which were impacting negatively on animal health and reproductive efficiency in businesses across the region. Without clear industry recommended guidelines or targets for reproductive success in beef cattle and a lack of technical beef extension support services within the region, producers were finding it difficult to work out what beef animal health and management practices should be adopted within their beef cattle enterprises.

Current practices within the group included:

- a wide range of joining periods (five to twelve weeks).
- a range of calving times from early autumn through to spring calving.
- a range of supplementary feeding options (from feeding pregnant cows only through to feeding weaner calves only).
- only a small proportion of producers were conducting fertility testing of bulls.
- only some producers were selecting bulls with EBV's for reproductive traits.
- only a small portion of the producers were weighing and monitoring the BCS of breeding heifers and cows throughout the reproductive cycle and managing nutrition accordingly.
- only some producers were pregnancy scanning their entire herd and very few were foetal aging and identifying those conceiving in the first cycle.

Common animal health and reproductive issues listed by producers included:

- the incidence of worms.
- reproductive diseases (including Bovine Viral Diarrhoea Virus (Pestivirus or BVD), Leptospirosis and Vibriosis), Infectious bovine rhinotracheitis (IBR).
- calf mortality caused by dystocia or calf scours.
- cow mortality related to metabolic disorders such as grass tetany and milk fever.
- Bull break-downs – structure and fertility.
- Reproductive wastage in the first few years.
- Poor conception rates in heifers.

This group of producers were eager to adopt best practices guidelines, along with collecting on-farm data to assess the effectiveness and practicality of guidelines for animal health and management practices to improve the reproductive efficiency and profitability amongst their herds. Following the survey, an initial group meeting was held in December 2020 to gain consensus from the group on the direction of the project.

Expectations – what the producers wanted to get out of the project.

- Better performance/conception in maiden heifer to second calvers.
- Benchmarking against others – reproduction against regional producers.
- Increasing the number of heifers that conceive in the first cycle.
- What's cost effective for increasing conception in heifers.
- Maximising the number of live calves on the ground.
- Increase in conception rate in second calving cows.
- Work out the ideal number of bulls per mob and joining length.
- Animal nutrition – pasture related.
- What is the most profitable system for heifer management and whole farm profitability.
- Target for heifers (weight and BCS).
- Meaningful data collection that aids/supports on-farm practices and addresses issues.
- Optimum breed/breed differences – within breed & between breeds – hybrid vigour.
- Where AI fits into the breeding program.

Potential topics identified for technical sessions.

- Worm management guidelines (worm egg testing, blood tests, drench resistance): Andrew Whale, Livestock Logic.
- Nutrition, Trace elements and metabolic disease (Sean McGrath, Millicent Veterinary Clinic, to help ID animal health issues).
- Reproductive diseases and vaccination guidelines for animal health conditions: Sean McGrath and others (Zooetis etc).
- Dystocia management (genetics vs management).
- Pregnancy scanning and foetal aging.
- The University of Adelaide project results – heifer management: Wayne Pitchford.
- Management: growth rates (target BCS), joining length, re-breeding rates.
- Genetics / Artificial Insemination (AI) reproductive technologies.
- Bull selection / bull breakdown / use of EBV's.
- Economic tools / calculators – The University of Adelaide, David Koopman.

1.2 Reproductive wastage from first time heifer joining to second calving

The purpose of the group was to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving, by understanding and adopting best practice monitoring and management practices for animal health, condition scoring and nutritional management. This extension project was linked with the MLA R&D project B.GPB.0038, '*Optimising heifer development and management to increase whole herd productivity.'* This was done to encourage faster adoption and facilitate greater extension opportunities from current relevant research that was being done in the region, rather than waiting until the completion of the research project.

The data collection aspects and methodology of this PDS and the R&D project B.GBP.0038 ran in parallel, with results of the R&D project being adopted by producers in real-time to see the impact on their production systems.

The aim of the R&D project B.GBP.0038 has been to develop a comprehensive understanding of optimum growth paths for modern heifers to achieve "wet-and-pregnant-early" (WAPE) status to increase whole enterprise profitability and to improve risk management. 'WAPE' is a measure that describes a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of joining. Once a heifer has achieved WAPE, they tend to proceed to be productive and robust as a mature cow.

Replacement heifer and general heifer development is a critically important area for any successful beef production system. Overall productivity of any herd is shown to increase when a high percentage of heifers become pregnant early on in their first breeding season and continue to be reproductively superior throughout their breeding lives. It is suggested that economic return is maximised when more primiparous heifers conceive again for a second pregnancy as two-year-olds. The risk of dystocia or calving difficulties is greater among heifers than typically observed in older cows and the time from calving to subsequent resumption of cycling is increased.

Once puberty is attained, it is vital that nutritional requirements are maintained at a viable level to allow the heifer to continue cycling, ovulate viable oocytes and establish pregnancy. Overall, the nutritional demands of a younger heifer significantly outweigh the demands for an old cow, as the heifer is attempting to produce nutrients for her own growth as well as the successful growth and development of the foetus. These demands then continue through to early lactation, and deficiencies of energy or protein for extended periods of time during any production phase throughout the first two and a half years of life will have a long-term negative impact on foetal development, calf viability, milk production and re-breeding for the next pregnancy.

As suggested by a local Limestone Coast veterinarian, appropriate nutrition was one of the main causes of reproductive wastage amongst heifers and needed to be re-evaluated to optimise reproductive performance.

In addition to nutritional management, the incidence of disease plays a significant role in a reduction of reproductive performance and overall beef herd production. Internal and external parasitism are inescapable constants that reduce returns in beef cattle production and can have a significant effect on younger reproductively sound heifers. It is suggested that replacement heifers are amongst the most susceptible to production losses because of depressed appetite, reduced feed digestibility and a disruption in normal metabolic or hormonal processes when infested with internal parasites such as worms.

Reproductive issues and diseases can result in female infertility, dystocia, and failure to produce a healthy calf that survives for longer than 24 hours. Reproductive inefficiency contributes to increased labour demands, higher mortality rates and an increased cost of animal health treatments along with lower beef production outputs per hectare.

This PDS project aimed to develop a comprehensive understanding of best practice health and management practices for first and second calvers coming out of the associated research project, to ensure optimum heifer reproduction rates and to minimise reproductive wastage. Some of the key messages from B.GBP.0038 that have been extended to the PDS project include the following:

- Only 40-70% of weaned heifers actually achieve WAPE.
- The EBV most closely associated with WAPE is days to calving (DTC).
- Bull scrotal size EBV is associated with heifer puberty, but less so with WAPE than expected.
- Heterosis or hybrid vigour increases growth and condition, and so a greater proportion of heifers are pubertal and likely to achieve WAPE.
- Pre-joining weight targets as a proportion of mature weight are commonly used but are old and possibly detrimental, given that most people underestimate the mature standard reference weight of their cows. This is even more so due to the genetic progress in growth rate of cattle over the last 20 years.
- The suggested time to get a mature standard reference weight for your herd, is to weigh mature cows two weeks after their calves are weaned, preferably at body condition score (BCS) 3.0.

- Each additional body condition score is worth around 70-80kg (depending on breed).
- Late calving heifers can be brought back into line with the herd to achieve WAPE if they are allocated additional feed.
- There is very little variation in biological efficiency of cows during autumn (or winter if this is the toughest time) when feed is limited and expensive, but those coming into autumn with more condition will require less supplementary feed. Those with less condition will likely be due to greater milk production or less ability to gain condition in spring.
- Heifer pre-joining weights are more important in autumn than spring calving herds as there is significant weight gain during spring joining.

1.3 Project aims

This project aimed to demonstrate improvements in cattle reproductive performance through the demonstration and adoption of best management techniques for the higher rainfall zone. Management techniques to be demonstrated and skills to be developed included:

- Replacement heifer selection, nutritional management (age and weight at joining, body condition score and nutritional targets) and length of joining.
- Nutritional management following first calving.
- Condition scoring of cattle.
- Keeping good reproductive records from joining to weaning, to identify where wastage is occurring (including pregnancy scanning: foetal aging and identification of twins for separate management).

The project will also address animal husbandry and welfare issues by:

- Demonstrating and assessing effective methods for monitoring worm burdens prior to key reproductive stages.
- Monitoring and testing for reproductive diseases and quantifying the cost-effectiveness of different management strategies.
- Educating participants on the use of EBV's for reproductive traits and minimising dystocia, and
- Educating participants on nutritional management through joining.

An overarching aim of the project was to increase southern beef productivity growth through an increase in producer capacity and skills to apply R&D outcomes to their farming operations, as well as through the implementation of 'best-practice' management systems to improve the productivity and profitability of beef enterprises within the Limestone Coast region of SA.

To achieve this, the PDS project was designed as a user-led extension and adoption program with coordinated technical and practice change support from experts, through the use of a collaborative model between the University of Adelaide, livestock advisers, animal health service providers, veterinarians, and producers within a larger farming systems group network. The project direction and topics was led by the producers within the group, with coordinated support from the participating collaborators within research, extension, and adoption fields.

2 Objectives

Objective 1
12 core producers will comprehensively measure and monitor pasture quantity and quality, condition score and heifer performance from weaning through to second calving.

This objective was partially achieved with 10 businesses submitting mob condition score, liveweights and reproductive data on their monitor mob (2020 drop heifers) from weaning through to second calving. Pasture quantity and quality was assessed regularly throughout the period, but not regularly reported. Eight of these producers also submitted mob data on their 2021 drop heifers through to first calving. Only one producer submitted individual data from their monitor mob from weaning through to second calving. An additional two producers had animal health investigations done, taking the total to 12 core producers taking measurements throughout the three-year period.

Objective 2
4 producer heifer demonstration sites (from within the core producer group) will also record the impact of different health issues and disease burdens on the overall reproductive rates of heifers and second time calvers over a three-year period and develop a cost-benefit analysis for preventative health treatments.

This objective was partially achieved with four producers within the group using the Millicent Veterinary clinic to investigate animal health issues within their monitor mobs in relation to weight loss or ill thrift. The results were presented to the wider group throughout the project and have been written up as an animal health case study. The health cost benefit calculator from MLA More beef from pastures was reviewed by one producer and results reported in a case study. Two other producers had post-mortems done on calves from their monitor mobs.

Objective 3
100% of the core producer group will have improved their skills and knowledge in relation to the management of heifers and second calvers, to contribute to their enterprise profitability. This will include live animal assessment; pasture availability and quality assessment; routine pregnancy scanning; recording reproductive data; management of animals according to liveweight, condition score and nutritional requirements; identification and prevention of losses due to animal health conditions.

This objective was achieved successfully with participants increasing their overall knowledge and skills score from 66% to 85% and their overall confidence score from 65% to 78%. Final KASA surveys showed participants confidence levels around 80% for: BCS assessment, managing herd according to nutritional requirements, assessment of pasture quality and quantity, managing reproductive and metabolic diseases in the herd, and using BREEDPLAN EBV's to select bulls to lift herd productivity. They also had 89% confidence in managing parasites (including worms) in the herd.

Objective 4
As a result of adoption of selected management techniques demonstrated or discussed within the PDS, 70% of producers within the core group will have increased their reproductive performance, along with having reduced mortality rates relative to their baseline data where possible.

Of the 10 producers who submitted mob data, the average heifer conception rates of 2020 drop heifers was 81% and 2021 drop heifers 84% compared to baseline levels of 76-83% across the previous three drops of heifers. There was a reduction in heifer mortality from 2.7% to 0.6% as well

as a reduction from 13% to 4% of heifers needing assistance at calving. Additionally, average re-conception rates of 2020 drop animals as second calvers increased from 88% (baseline) to 92%. Cow mortality in second calving cows reduced slightly from 0.2% to 0%.

Objective 5
The core producers will be well-linked into the MLA R&D project B.GPB.0038, with a flow of information from B.GPB.0038 to the PDS which aims to keep the core producers up to date with the latest information and results. Extension and adoption activities within the LC Beef Producer Groups will extend beyond the life of the PDS project.

This objective was achieved successfully with the group deciding at the December 2023 meeting to continue for a further two and a half years as a beef discussion group. A planning session was held, and topics included continuing to fine-tune what they have learnt over the last three years, as well as hearing from other invited guest speakers, in particular other R&D projects, as they have valued the linkage with the MLA R&D project. The consultants involved within this project will also continue to be involved, and it is likely that this group will be well linked into future Beef RD&A projects, including the *"Profitable and resilient Southern Beef herds (MBfP 2.0)".*

Objective 6
20% of the observer group (50 additional producers) will have engaged in the project through either online webinar forums and field days and increased their knowledge and skills in relation to heifer and second calver reproductive performance.

This objective was achieved successfully with an additional 90 people engaged in the project through attendance at sessions open to the public through Mackillop Farm Management Group livestock field days. Of these extras, 76 were producers and the remaining 14 were either Livestock advisers, veterinarians, or researchers. Evaluations were done at these field days and are reported separately in this report. A further group of livestock advisers were engaged in the project via a presentation at the MLA Livestock Adviser Update, held in Melbourne in September 2022.

Objective 7
10% of the observer group (25 additional producers) will have adopted or intend to adopt selected management techniques demonstrated or discussed within the PDS.

This objective was achieved successfully with post-KASA surveys indicating a high level of adoption or intention to adopt selected management techniques demonstrated or discussed within the PDS. Of note, 36% of the producer group had never conducted pregnancy scanning prior to the project, with 100% now adopting this practice. Also 100% of the group reported that they had adopted recording herd performance data annually as well as having a breeding objective and using EBV's when selecting bulls.

3 Demonstration site design and methodology

3.1 Monitor mob data-recording

A group of 32 producers, representing 19 participating beef businesses with 18,600 breeding cows across 49,000 ha of farmland within the Limestone Coast region, were involved in the Beef PDS discussion group between December 2020 and December 2023. Ten of these producers (representing 5,330 breeding cows) monitored the liveweights and body condition scores of their 2020 drop heifers, joined in 2021 to calve as heifers in 2022 and as second calvers in 2023. All businesses within the group were encouraged to have a monitor mob of 2020 drop heifers to follow from weaning to their second calving in 2023 and record reproduction results through the 3-year project.

Table 1, below, was sent to producers to help track which mobs of cattle would be followed through the project. The aim was for baseline data to be collected from heifers and second calvers that calved in 2020. Data was also collected from 2019 drop heifers. 2019 calving records were optional. Table 2 was the baseline data recording sheet sent to producers.

Table 1 – Summary table of which cattle were followed through the project (highlighted in yellow)

	1st Joining	1st Calving	2nd Calving
2017 drop heifers (N - white tag)	2018	2019	**2020**
2018 drop heifers (P - orange tag)	2019	**2020**	2021
2019 drop heifers (Q - green tag)	2020	**2021**	**2022**
****2020 drop heifers (R - purple)****	**2021**	**2022**	**2023**
2021 drop heifers (S - yellow)	**2022**	2023	2024

Table 2 – Baseline data recording sheet

	2nd calvers in 2020	Heifers (calved in 2020)
Baseline data	**2017 drop (N - white tag)**	**2018 drop (P - orange tag)**
Number joined in 2019		
Joining dates (start-finish)		
Average liveweight at joining		
Is this weight estimated or measured?		
Body Condition Score (if known)		
Number PTIC (Preg-Tested In-Calf) for 2020 calving		
Number dry		
Number calved down (minus sales, culls, dries)		
2020 calving		
Number calves born (dead + alive)		
Number assisted births (if known)		
Number calves born alive (if known)		
Number of calves marked		
Number of calves weaned		
Cow mortality (calving to weaning)		

The main monitor mob that producers were asked to follow through was the 2020 drop heifers (weaning through to first and second calving). Since the project ran until December 2023, collection of 2021-drop heifers calving as heifers in 2023 was also collected. The following templates (Table 3 and Table 4) were provided to producers to record mob-based data on their monitor mobs.

Producers were also asked to record animal health treatments on their monitor mobs and to investigate any ill-thrift or disease issues that arose throughout the project. These animal health investigations were conducted by Sean McGrath, Millicent Veterinary Clinic, and reported separately as an animal health case study. Seasonal nutrition and animal health issues were discussed within the interactive technical sessions and involved 'round the room' sharing and problem solving alongside livestock and veterinary consultants involved in the project.

Table 3 – Monitor mob data collection template (weaning to first calving in 2022)

2020 drop heifers - purple tags - R's	Mob -
Total number weaned / purchased	
Weaning weight	
Weaning date	
Weaning BCS	
Total number joined	
Joining start date (bulls in)	
Joining finish date (bulls out)	
Joining weight average (bulls in)	
Joining weight average (bulls out)	
Joining BCS (start -finish)	
Feed on offer during joining (kg/ha)	
Quality FOO (low, med, high, v.high)	
ADG during joining	
Date of Preg scanning	
total no. pregnancy tested in calf (PTIC)	
Total no. empty	
total no. deaths	
no. PTIC keep	
no. PTIC sell	
Date of 1st calving	
Feed on offer during calving (kg/ha)	
Quality FOO (low, med, high, v.high)	
Supplementary feeding (Yes / No)	
no. heifers calved unassisted	
no. heifers pulled	
no. heifer deaths from calving	
Total no. live calves born	
Total no. dead calves born	
Total no. live calves marking	
total no. live calves weaning	

Table 4 – Monitor mob data collection template (joining 2022 to calving 2023)

2020 drop heifers - purple tags - R's	Mob -
Total number retained after weaning 1st calves	
Weight of cow at calf weaning	
Weaning date	
BCS of cow at calf weaning	
Total number 2nd calvers joined	
Joining start date (bulls in)	
Joining finish date (bulls out)	
Joining weight average (bulls in)	
Joining weight average (bulls out)	
Joining BCS (start -finish)	
Feed on offer during joining (kg/ha)	
Quality FOO (low, med, high, v.high)	
ADG during joining	
Date of Preg scanning	
total no. pregnancy tested in calf (PTIC)	
Total no. empty	
total no. deaths	
no. PTIC keep	
no. PTIC sell	
Date of 1st calving	
Feed on offer during calving (kg/ha)	
Quality FOO (low, med, high, v.high)	
Supplementary feeding (Yes / No)	
no. heifers calved unassisted	
no. heifers pulled	
no. heifer deaths from calving	
Total no. live calves born	
Total no. dead calves born	
Total no. live calves marking	
total no. live calves weaning	

Table 5, below, shows the reproductive calendar for the three most common calving systems amongst the project participants.

- Autumn calving = February to April, Winter calving = May to July, Spring calving = August to September.

Table 5 - Calving system management calendar

3.2 Case studies

3.2.1 Producer case studies

Four producers were identified, and livestock consultants involved in the project conducted phone calls and face-to-face interviews to collate the information to write these case studies.

Case studies were written for Farm 2, Farm 4, Farm 6, and Farm 7, with a further case study written for Farm 1 as part of an MLA Feedback magazine article.

3.2.2 Animal health case study disease investigation

Sean McGath, from the Millicent Veterinary Clinic was sub-contracted to the project and participated in every host visit and technical session throughout the project. He worked with four producers with identified animal health issues within their monitor mobs and assisted with recommendations for treatment. The majority of testing was done in response to an identified problem from the farmers involved and was generally a problem of weight loss or ill thrift within different heifer groups.

Interestingly, all the investigations were done at different periods of the heifer reproduction cycle, but all of equal importance. Investigations in the different groups were done at pre-joining for the first time, pre-calving for the first time and post-calving or pre-joining for the second time. It is relevant that the animals within the investigations were all in low body weight at these critical time points, where low body weight has the potential to affect reproductive performance. Investigations were done on Farm 1, 2 and 3 and included blood and faeces collected for testing for liver and kidney markers, trace elements and worm burden markers, as well as testing for infectious diseases. The final investigation on Farm 4 was focussed on a specific disease, BVD, and a risk assessment for heifers leading into their first joining. A decision on whether to vaccinate for that disease pre-joining to mitigate the risk of reduced reproductive performance could then be made based on test results.

Other animal health investigations throughout the project were post-mortems conducted on Farm 7 and 9, and several producers employed the services of the Millicent Veterinary Clinic to set up yearly animal health calendars for their beef enterprise (Farms 2, 6, 7 and 8).

To assist in reading the results, the following definitions and information on some of the tests that were performed may be useful. Normal reference ranges will be provided in each results table.

Trace elements and liver or kidney biochemistry

- Glutathione peroxidase (GSH Px) is a marker for selenium.
- Copper – measure of copper levels.
- Vitamin B12 – is a marker for cobalt.
- Liver and kidney markers are identified as a group of biochemistry markers urea, creatine, and phosphate.
- For all markers below the reference range indicates a deficiency, within the ranges indicate adequate levels and above the range indicates excess.

Pestivirus (BVD) and Leptospirosis serology

These are reported as either positive or negative. Positive results mean the animal has been exposed to the virus or bacteria and mounted an immune response. They are sometimes reported as titres, which gives a context of time since exposure, or the level of antibodies present.

Worm burden markers

- Pepsinogen is the marker for abomasum damage, which is where Ostertagia worms reside and cause damage. Ostertagia are the main worms of production significance in cattle.
- Results above the reference range indicate abomasal damage and a significant worm burden. Higher results indicate more damage and higher worm burden.

3.3 Beef profit drivers and economic analysis

Financial literacy in the livestock industry was low with initial pre-KASA surveys indicating that only 26% of the group calculated their beef cost of production (c/kg liveweight). Throughout the project there was a large focus on providing technical sessions to assist producers understand the key profit drivers within their beef enterprises and encourage them to do further economic analysis or financial benchmarking (Session 4, Session 7, Session 8, Session 9 and Session 10).

3.3.1 Maternal productivity decision support tool

The maternal productivity decision support tool, developed in B.GBP.0038, was also demonstrated in technical Session 8, and was piloted by a couple of participants within the group. Figure 1 shows an example of the model inputs page.

Figure 1 – Maternal productivity decision support tool

Model Inputs

Farm area (ha)	1500

Stock category	Numbers on hand	Numbers sold	Sale Values	
10yo cows				
9yo cows	65	63	1400	
8yo cows	75	73	1400	
7yo cows	85	26	1400	
6yo cows	110	11	1500	
5yo cows	140	14	1500	
4yo cows	150	15	1500	
3yo cows	180	18	1200	
2yo cows	195	20	1100	
heifers	400	100	2500	Sold PTIC
		100	2000	Sold PTE
Heifer calves		40	1200	
Steer calves			1800	
bulls	25	5	2500	

No of bulls purchased	5
No of heifers required as replacement	195
Calving %	99%
Supplementary feed (t)	1000
Supplementary feed price ($/t)	260
Pasture costs	60000
Gross Margin/ha	**$ 734.37**
Gross Margin/cow	**$ 786.83**

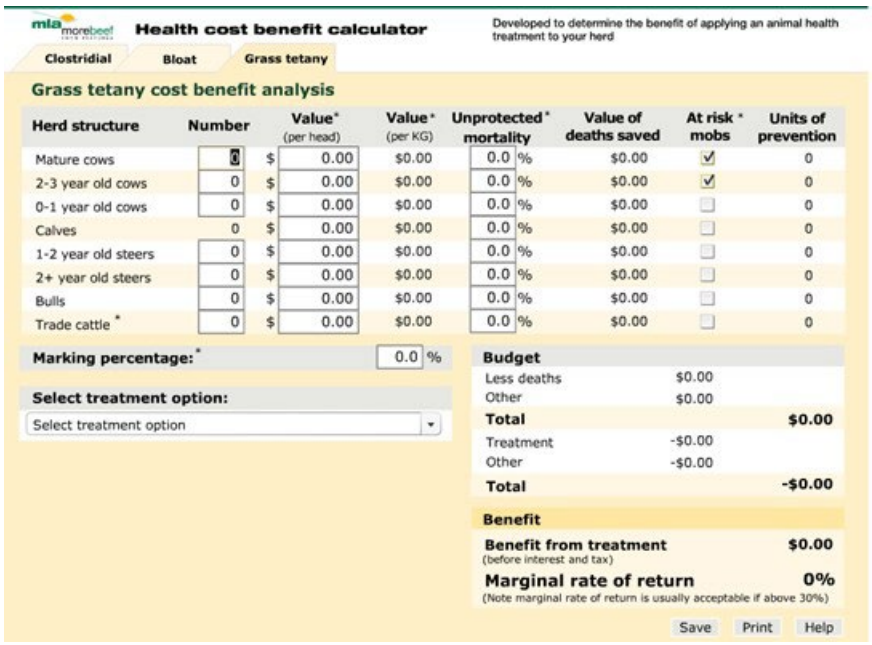
Use the input sheet to add information on your herd
Additional information should not be added directly to the Stock trading statement and Gross marin sheets
Instructions are available in the red flags on individual cells in the spreadsheet

3.3.2 MLA health cost benefit calculator

MLA's health cost benefit calculator was utilised within one of the case study farms (Farm 2) to calculate the benefit of using magnesium blocks for the prevention of grass tetany in their herd.

https://www.mla.com.au/extension-training-and-tools/creative-commons-licenses/data/health-cost-benefit-calculator/

Figure 2 – MLA health cost benefit calculator



3.4 Extension and communications

3.4.1 Host farm visits and technical sessions and MFMG livestock field days

Target: 7 host farm visits to be held at the core producer demonstration sites (11 properties visited).
Target: 3 technical sessions with industry / veterinary expert.

The discussion group consisted of 32 producers, representing 19 participating beef businesses, with 18,600 breeding cows within the Limestone Coast region. This group met in person a total of 12 times over the course of the project and visited 11 host properties from within the group.

Producers involved in the beef discussion group visited a host farm (selected prior to each meeting from within the group) to observe and learn more about the different management practices being implemented at that property. The aim of these days was for the host producers to explain their production system, communicate data and observations from the monitor mob, receive feedback and engage in peer-to-peer discussions with the wider group.

Sessions were tailored to producer needs so that they could learn from technical experts and researchers and to use MLA tools and calculators, practice skills such as condition scoring and pasture assessment, as well as engaging in peer-to-peer learning. This design gave participants an opportunity to increase their skill levels and knowledge within a supported environment to give them the confidence and skills to adopt different reproductive health and management practices with the aim of increasing heifer reproduction, productivity, and profitability.

A session plan was developed for each host farm visit and included pasture assessment, body condition scoring of the host monitor mob, 'round the room' producer snapshot of their monitor mob and any seasonal or animal health issues, presentation from host producer on their business, and a technical presentation from a livestock consultant, veterinarian, or researcher (topic decided by producers at the previous session). Table 6 shows a typical session plan used within the project and the delivery team who attended most sessions throughout the three-year project.

Elke Hocking (Elke Hocking Consulting) facilitated and planned all sessions with assistance from Livestock Consultant Intern Emma Peters and then Ashlee Carslake-Hunt (Tailored Livestock Consulting). Sean McGrath (Millicent Veterinary Clinic) and Tim Prance (T. Prance Consulting) attended all sessions to give technical advice on animal health and pasture assessment respectively and animal nutrition.

Table 6 – Session plan for host farm visits and technical sessions

Time	**Activity**	**Facilitator**
10.15 – 10.45 (30 mins)	Pasture Assessment – current FOO and quality reflective of the district	Tim Prance, T. Prance Consulting *Paddock*
	MORNING TEA 10.45 – 11am	
11.00 -11.45pm (45 mins)	Snapshot of any issues since last meeting, how did bull purchases go. Monitor mob – weight, BCS, FOO, quality, supplementary feed type, pre-calving treatments, stage of breeding cycle/calving time (Populate table)	Elke Hocking *Shed*
11.45-12.30pm 12.30-1.00pm (75 mins)	Nutritional requirements (45 mins) Calculations of your own requirements and what you are supplying (Feedtests) – 15 mins. (Populate table: Current requirements, supplied MJ, gap) – put figures in when finished calculations. Implications of any gaps – group discussion (15 mins)	Ash Hunt, Tailored Livestock Consulting Elke / Sean / Ash assist *Shed*
LUNCH 1.00 – 1.45pm		
1.45-2.15pm (30 mins)	What to look for during calving, when to call the vet. Temporary weaning, foetal growth curves, pelvic measurements etc.	Sean McGrath, Millicent Veterinary Clinic
2.15-2.30pm (15 mins)	Host farm discussion. Current breeding objective, management, and production systems, monitor mob (as above), how did you arrive at the management system you have now (past beef groups etc). COP? what works well, what could be improved. Future goals for the business.	Host producer *Shed*
2.30-2.40pm	Walk to yards	
2:40pm – 3.10pm (30 mins)	Practical session in yards. Body Condition Scoring of monitor mob (2020 drop heifers) and discussion of management by host. Calf scour prevention (vaccination).	Sean McGrath / Host producer ***Yards***
3.10 - 3.25	Drive to pasture	
3.25 – 3.50pm (25 mins)	Pasture grazing rotation management system – where it started and where it is now.	Host producer / Tim Prance ***Paddock***
3:50pm – 4.00pm	Evaluation, set next date, host, and topic	Elke Hocking

3.4.2 Project communications

Timing	Communications tactics (e.g. written producer case study, video)	Communications channel (e.g. Feedback magazine, media release)	Messages
Dec 2020, March, May & Dec 2021, March, May & Dec 2022, April & Dec 2023	**On-farm discussion group meetings – host farm visits** 11 host farm visits (Target=7) were held at the core producer demonstration sites. These are for producers involved in the wider discussion group along with core producers	Private email and producer group discussions.	Key messages will be determined by the specific topics addressed within the meeting and will cover all aspects of the aims of the project throughout the 7 host farm visits.
August 2021, 2022, 2023	**MFMG Livestock Field Days** Field days are for core producers, observer producers and the broader industry. One field day will be conducted in each year of the project to showcase the results of the project.	MFMG's newsletter, MFMG's social media platforms	Key messages will be the reporting of key findings from the group's results from the demonstration sites.
Dec 2020	**Workshop** Interactive skill development workshop – host farm Skill development workshops are for core producers and the wider discussion group. Go through the requirements of the PDS sites, including condition scoring, FOO assessment techniques and to establish current 'best practice' management guidelines for the group.	Private email and producer group discussion.	- Selection of monitor mob for PDS - Body condition scoring in heifers - Assessment of FOO (Pasture quantity) and quality
2023	**Videos** 5-minute project summary video for MFMG social media and newsletters (Target=3 videos) Summary videos are for core producers, observe producers and the broader industry.	MFMG's newsletter and social media platforms	Key messages from producer members/technical experts on the benefits of monitoring and optimally managing their heifers through to second calving; "how-to" video on Body condition scoring.

Timing	Communications tactics (e.g. written producer case study, video)	Communications channel (e.g. Feedback magazine, media release)	Messages
Dec 2021, 2022, 2023	**In depth articles** One article per year for the project in MFMG's seasonal newsletter (Target=3 articles) In depth articles are for core producers, observe producers and the broader industry.	MFMG's newsletter Potential for these to be put out to general media (Stock Journal)	Key messages on the economic and production benefits of monitoring and optimally managing heifers through to second calving.
Dec 2023	**Case studies** One case study at the conclusion of the project, covering information on the reproductive component of the project. One case study at the conclusion of the project, covering information on all animal health demonstration sites. 4 – 5 case studies in total	**Feedback magazine** MFMG's newsletter, MFMG's social media platforms.	Key messages from 4-5 of the producer demonstration sites outlining key findings-economic and production benefits of adopting certain management practices.
2022 & 2023	**Podcasts** One podcast episode on MFMG's podcast per year of the project (Target=3 podcasts) Podcasts are for core producers, observe producers and the broader industry.	MFMG's podcast, MFMG's social media platforms	Interview with technical experts or core producers on particular topics covered throughout the project.
May, Aug & Dec 2021, May, Aug & Dec 2022, May, Aug & Dec 2023	**Social media posts** Three posts of MFMG's social media platforms/channels per year (Target=9 social media posts) Social media posts are for core producers, observe producers and the broader industry.	MFMG's social media platforms	Snippets of information / links to other communications from the PDS (Case studies, videos, podcasts, upcoming field days etc)
Ongoing	**MFMG website project page** Maintenance of project webpage on MFMG's website.	MFMG's website	Progress reports and results from the PDS to inform the wider MFMG producer group.
After project completion	**Guest speaker for other producer groups across the state**	Producer group talks/field days/ local media etc	Results from the PDS to inform the wider beef producer audience in SA.

3.5 Monitoring and evaluation

MLA's monitoring, evaluation, and reporting (MER) guidelines and the MER framework developed by *QualDATA* for MLA were followed throughout this project and aimed to address the following.

a. What did we do?
   - Number of participants – direct (core participants - involved in demonstration sites) and indirect (observer - part of a broader group or attending field days etc).
   - Trial /demonstration data obtained – to demonstrate what we did.
   - Products and information documents produced and communicated.

b. How well did we do it?
   - Measure whether anyone has changed their knowledge and awareness about the issue or their skills to influence it:
   - Surveys of participants (those who are directly involved (core participants) and those that are indirectly involved (observers)) before and after the project/event to assess changes to Knowledge, Attitudes, Skills, and perceived value in relation to the solution that is being demonstrated for producer consideration and possible adoption.

c. Has it changed what people do (have they adopted different practices)?
   - By participating in the project (or observing it) have people changed what they are doing?
   - Have people made specific changes (adopted new practices / technologies) as a result of the project?
   - If changes were made, what was the adoption scale (i.e. whole farm/business, partial)?
   - Survey of core participants to benchmark the targeted practices and performance metrics before and after the demonstration.
   - Will people be more likely to change practices in the future (intentions or aspirations)?

d. Is anyone better off?
   - Are there any key lessons/learnings for other projects?
   - Have people actually benefitted from the project and by how much?
   - What are the costs and benefits from making these changes for individuals?
   - Are more people likely to benefit in the future (core and observer participants)?
   - What have we learnt that we expected?
   - What have we learnt that we didn't expect?
   - Are there any lessons for others/projects?

e. Is the industry better off?
   - How might the broader industry benefit from the project? Who else might the practice change apply to (e.g. would others in the region be likely to adopt it?)
   - Has this been communicated?

See Appendix 7.2.1 and 7.2.2 for MER Pre-KASA and Post-KASA survey and evaluation forms used throughout the project.

4 Results

4.1 Demonstration site monitor mob results

The original aim was for producers to collect individual animal measurements, along with pasture feed on offer and quality, however, it soon became clear that this would not be possible. Since producers within the group had calving times from February through to September, it was determined that any meaningful analysis from the collation of individual data over the three-year period would be problematic. The spread of calving times also meant there were logistical issues trying to coordinate and set deadlines for data collection. It was also apparent early on that many producers, although all cattle have mandatory eID tags, not many producers in the group understood how to record data, or if they had recorded individual livestock weights, they didn't know how to download the data to send through.

Since this was an adoption project and not a research project it was decided that if mob-based data from producers could be collected from their monitor mobs, that would be sufficient to encourage the concept of keeping better records. Additionally, one of the main aims was for producers to adopt the research outcomes from the Adelaide University project (which has extensive individual records and analysis) and therefore, monitoring and measuring mob-based data was thought to be sufficient to track their ability to meet targets for reproductive success.

Over the last three-years, different producers chose to focus on different areas of their cattle enterprise (such as calving time, foetal aging, beef profit drivers, use of Optiweigh for monitoring worms, and animal health investigations). Some of these have been written up as case studies, other information has been shared within peer-to-peer discussions during host farm visits. Table 7 shows the number of farms that either collected mob-based data, were interviewed for case studies, or conducted animal health investigations on their monitor mob throughout the project.

Table 7 – Farm data collection matrix. Calving time: A=autumn, W=winter, S=spring

	Farm 1 (A)	Farm 2 (W)	Farm 3 (A)	Farm 4 (A)	Farm 5 (W)	Farm 6 (W)	Farm 7 (A)	Farm 8 (S)	Farm 9 (S)	Farm 10 (S)	Farm 11 (A)	Farm 12 (A)
Monitor mob data	√√	√ √ *			√√	√	√√	√√	√√	√√	√√	√
Animal health	√	√	√	√			√		√			
Case Study	√	√		√		√	√					

** Individual data provided. √=monitor mob data, √√=monitor mob data plus 2021 drop heifer data*

The following series of tables for each of the farms has been collated from submitted producer data. The first table for each farm shows a summary of key management dates on the reproduction calendar for each business, the metabolisable energy (ME) requirements (MJ ME per kg dry matter) and some information that was reported on feed on offer (FOO) and supplementary feeding. The subsequent two tables show farm heifer reproductive data for heifers and for second calvers and contains baseline data as well as monitor mob data. Some producers were able to supply more data than others, depending on their record keeping ability or other infrastructural limitations.

Farm 1

Farm 1 was an autumn calver and was able to provide good baseline and monitor mob data, along with conducting an animal health investigation and participating in a case study. This producer runs a Hereford x Simmental cross and Angus x Black Simmental herd.

Table 8 – Farm 1 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned December 2020, 376 kg average weaning weight (wwt)

Reference Cow liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Average lwt 438kg)	Average daily gain (ADG) joining	Heifers PTIC	Calving	2nd joining (Average lwt 600kg, BCS 3)	Calving
650-700kg	5th May to 16th June 2021	Maintain	Early August 2021	14th Feb 2022 (start)	21st May to 9th July 2022	28th Feb 2023 (start)
FOO kg DM/ha	1200 kg (600 green, 600 dry)			1800-2000 kg	1200-1400 kg	
Pasture quality	Dry low-medium			Low	High	
ME requirements (MJ ME/kg DM)	65			61	167	
Supplementary Feed	4 kg every 2 days Clover ryegrass hay			4 kg every 2 days Clover ryegrass hay	Ryegrass and shaftal hay	

Figure 3 – Farm 1 feed on offer prior to joining on the 24th March 2021

Table 9 – Farm 1 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2018 (P)	2019 (42)	410 kg BCS 2	59%	78%	2020 (Feb)	92%	6.3%	0%	56%
2019 (Q)	2020 (42)	410 kg BCS 2	59%	87%	2021 (Feb)	82%	15%	0%	53%
2020 (R) Heifer	2021 (42)	438 kg BCS 3.0	63%	72%	2022 (Feb)	89%	11%	0%	55%
2021 (S) Heifer	2022 (38)	385 kg BCS 3.0	55%	83%	2023 (Feb)	94%	6%	0%	83%

Heifers in the monitor mob suffered from Lesser loose strife toxicity and had significant worm burdens of Ostertagia, as demonstrated by blood testing in May 2021 after a portion of the mob showed signs of ill thrift. This would have had a detrimental effect on heifer conception rate for the monitor mob which was down to 72%. However, heifer conception rates were improved to 83% in the following year's heifers. Weaning percentages to joining were low for 2018 – 2020 drop animals due to a portion of PTIC heifers being sold and not calved down. Assistance at calving was quite high, however was often due to early intervention which paid off with zero mortality rates in heifers.

Table 10 – Farm 1 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving year & month	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019 (56)	570kg BCS 2.5	81%	91%	2020 (Mar)	99%	1.3%	1.3%	80%
2018 (P)	2020 (42)	570kg BCS	81%	92%	2021 (Mar)	98%	1.6%	0%	59%
2019 (Q)	2021 (42)	570kg BCS	81%	90%	2022 (Mar)	98%	2.2%	0%	80%
2020 (R) Heifer	2022 (38)	600kg BCS 3	86%	92%	2023 (Mar)	96%	1%	0%	85%

Second calf conception rates were fairly consistent with excellent rates of 90 to 92%, low assistance rates at calving, minimal cow mortality and subsequent weaning rates between 80% and 85% (with the exception of 2018 drop which also had PTIC heifers sold).

Farm 2

Farm 2 was the only participant to supply a complete set of individual data on their monitor mob from joining through to the weaning of their second calves. They also conducted an animal health investigation and participated in a case study. This producer runs a Hereford Angus x Simmental herd and purchases all of their heifer replacements from another family property on Kangaroo Island. Baseline data shows that heifer calving was previously in winter (June and July), but then shifted to an autumn calving for heifers and winter calving in June and July for second calving cows, allowing a longer recovery period prior to re-joining.

Table 11 – Farm 2 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned December 2020. Average weaning weight December 2020 = 306kg. Final average liveweight December 2023 = 642kg

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 339-424kg) BCS 3-4	Average daily gain (ADG) joining	Heifers PTIC (Average lwt 532kg)	Calving (Average lwt 536kg)	2nd joining (Lwt range 516-645 kg, BCS 3-4)	ADG joining	Calving (Average lwt 595kg)
650 kg	15th Aug- 19th Sept 2021	1.5kg /hd/day	16th Dec 2021	24th May 2022 (start)	22nd Aug-26th Sept 2022	1.0kg /hd/day	1st June 2023 (start)
FOO kg DM/ha	1200 kg +			<800 kg	1200 kg +		<800kg
Pasture quality	Very high			Very high	Very High		High
ME requirements (MJ ME/kg DM)	53			152	167		167
Supplementary Feed				12kg/hd/day Cereal hay			12kg/hd/day Pasture hay

Figure 4 – Farm 2 feed on offer prior to joining (July 2021 = 1200 kg DM/ha FOO)

One of the benefits of joining in spring for a winter calving is that heifers are on a rising plane of nutrition, which Adelaide University data from the linked heifer reproduction project, has shown to be more important for heifer conception rates than the starting joining weight. Despite average daily gains around 1.5kg per head per day through joining, conception rates for heifers were only around 78% (Table 12).

One of the explanations for this is that this producer joins 100% of the purchased heifers of which a large proportion are out of first and second calf heifers and are often lighter in weight at weaning. The source herd also has a moderate number of twins and there are normally a proportion of "*free martins*" in the mob, which are infertile. This has not been a significant economic issue though since more heifers are purchased and joined than what has been needed for replacements, and any not pregnancy tested in calf (PTIC) get sold as yearling finished animals into premium grassfed markets.

Table 12 – Farm 2 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2019 (Q)	2020 (43)	.	.	66%	2021 (July)	96%	7%	0%	63%
2020 (R) Heifer	2021 (35)	339kg BCS 3.0	52%	78%	2022 (June)	96%	9.7%	0%	73%
2021 (S) Heifer	2022 (60)	450kg BCS 3.5	69%	75%	2023 (April)	97%	5.3%	0%	71%

Table 13 – Farm 2 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2019 (Q)	2021 (42)	BCS 4+	.	92%	2022 (June)	96%	0%	0%	88%
2020 (R) Heifer	2022 (38)	520kg BCS 3-4	80%	90%	2023 (June)	100%	0%	0%	87%

It is interesting to note that the Q-drop heifers were calved down between the 11th of July and the 23rd of August 2021, then re-joined on the 27th of August to the 8th of October (after the last calf was dropped) and effectively brought back to a June calving, achieving 92% re-conception rates. The success can be explained due to the high quality and quantity of feed on offer and high BCS of heifers at calving. Figure 5 shows that cows can return to first cycle post calving as early as 31 days if they are in good condition and achieve 90% re-conception rates if high feed is on offer. In this case, the mid-point of calving was around the 25th of July, meaning that when the bull went in, they would have been at 33 days post calving. This is useful information to know what can be achieved if calving time ever needs to be brought back for other management reasons.

Figure 5 – Effect of nutrition post-calving and condition scores of cows at calving on cow reproductive performance

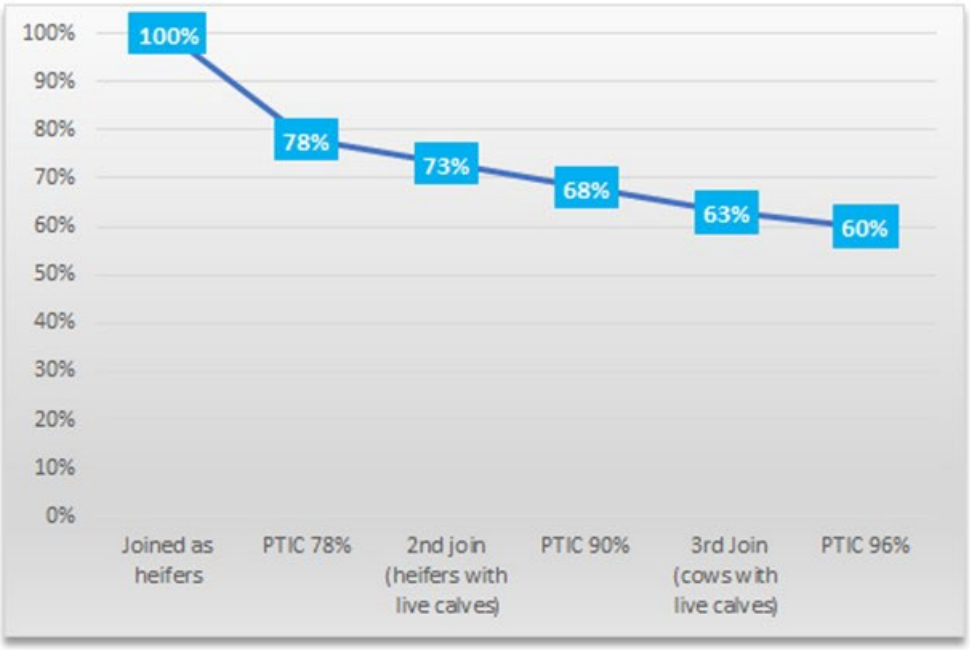
	Feed availability*	Condition score at calving		
		1.5–2.0	2.5–3.0	3.5–4.0
Days to return to first cycle post calving	high feed	49	38	31
	low feed	65	45	38
Pregnancy rate	high feed	84	92	90
	low feed	70	87	86

Source: ReproActiv, Zoetis

The linked heifer reproduction R&D project describes 'WAPE' as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of joining. Once a heifer

has achieved WAPE, they tend to proceed to be productive and robust as a mature cow. The following graph (Figure 6) shows the greatest decline in numbers occurred after heifer joining and that only 68% of heifers achieved WAPE by the second joining. By the third joining only 60% of those originally joined as heifers remained in the mob.

Figure 6 – Heifer loss from first time joining through to PTIC after second calving (R – 2020 drop)



Heifer replacements were purchased in December 2020 and individual weights and calving records kept through until re-conception after having their second calf. Empty heifers had lighter weights at weaning and the start of joining but had caught up by the end of the joining period. By the second joining, heifers had reached 80% of their mature reference weights and achieved 90% re-conception rates. By the third joining, second calving cows had reached 100% of their mature reference weight and achieved 96% re-conception rates.

Table 14 – Average liveweights (kg) of heifers in monitor mob (Farm 2)

Reference Cow liveweight (lwt) 650kg, condition score (BCS) 3.0	18th Dec 2020	4th Aug 2021	28th Sept 2021	18th Dec 2021	19th April 2022	27th July 2022	30th Nov 2022	12th May 2023	30th Nov 2023
Management	**Weaning**	**Pre-joining**	**Post-joining**	**PTIC**	**Pre-calving**	**Pre-joining**	**Post-joining**	**Pre-calving**	**Post-joining**
Empty heifers average liveweight (kg)	296	336	424	534	Sold				
PTIC heifers average liveweight (kg)	307 (47% ref wt)	340 (52% ref wt)	423 (65% ref wt)	532	536 (82% ref wt)	520 (80% ref wt)	651 (100% ref wt)	596	642

Farm 5

Farm 5 was a winter calver and was only able to provide monitor mob (2020 drop heifer) data and the subsequent 2021 heifer drop mob data. This producer runs a self-replacing Angus herd and practices regenerative farming, with rotational grazing of large mobs and the use of 'set-aside' paddocks to maintain cows over summer and autumn. Pastures aren't grazed under 1000 kg DM/ha and are given a 45-day minimum rest between grazing's. Dung beetles are also used in the system to improve soil structure. Although worm egg counts are done regularly, this farm hasn't needed to drench older cattle for 10 years.

Figure 7 – Example of a 'set-aside' paddock and dung beetle nursery

Table 15 – Farm 5 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers

Reference Cow liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 346-448kg) BCS 3-3.5	Average daily gain (ADG) joining	Heifers PTIC (Average lwt 500kg, BCS 3+)	Calving	2nd joining (Average lwt 580 kg, BCS 2.7)	ADG joining	Calving
630 kg	21st Sept to 5th Nov 2021	2.5kg /hd/day	25th March 2021	1st July 2022 (start)	1st Sept to 27th October 2022	High	1st June 2023 (start)
FOO kg DM/ha	2000kg		3000kg	1500-1800	2000kg		
Pasture quality	Very high		Low-6MJ ME/kg DM (Set aside paddocks)	Very high			
ME requirements (MJ ME/kg DM)	53		90	152	167		167
Supplementary feeding			Loose lick 8% urea				

Table 16 – Farm 5 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2020 (R) Heifer	2021 (45)	346kg BCS 3.5	55%	74%	2022 (July)	98%	1.9%	0.9%	72%
2021 (S) Heifer	2022 (56)	418kg BCS 3.0	66%	84%	2023 (June)	99%	0.8%	0%	83%

Table 17 – Farm 5 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2020 (R) Heifer	2022 (56)	580kg BCS 2.7	92%	66%	2023 (June)	98%	0%	0%	66%

Farm 6

Farm 6 was a winter calver but has recently changed over to spring calving in August. This producer runs a self-replacing Angus beef herd and also participated in a case study. Limited data was provided due to having limited yard facilities for weighing livestock. A recently upgraded set of yards and participation in this project has given the incentive to purchase a set of permanent liveweight scales in the yards so that liveweight recording can be done on a more regular basis to better monitor key target liveweights throughout the reproductive cycle.

Table 18 – Farm 6 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned March 2021 (liveweight range 200-250kg)

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 365-385kg) BCS 3.5	Average daily gain (ADG) joining	Heifers PTIC (Average 420kg, BCS 3.2)	Calving (Average lwt 450kg, BCS 2.8)	2nd joining (Lwt range 420-500kg BCS 3.5)	ADG joining	Calving
650 kg	12th Oct to 6th Dec 2021	360g /hd/day	30th Jan 2022	22nd July 2022 (Start)	24th Oct to 6th Dec 2022	Maintain-increasing	3rd August 2023 (start)
FOO kg DM/ha	2500 kg		1200 kg	1000 kg		1.9kg /hd/day	2500 kg
Pasture quality	Medium		Low=4MJ ME/kg DM	High			Very high
ME requirements (MJ ME/kg DM)	53		60	122	167		
Supplementary Feeding			Pasture hay (annual ryegrass and clover 8.9MJ)	3kg/hd/day ryegrass and clover hay			

Table 19 – Farm 6 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2018 (P)	2019 (53)	.	.	53%	2020 (Feb)	93%	6.9%	0%	49%
2019 (Q)	2020 (53)	.	.	.	2021 (Feb)	.	.	.	.
2020 (R) Heifer	2021 (55)	385kg BCS 3.5	70%	84%	2022 (July)	93%	8%	0.5%	77%

Table 20 – Farm 6 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2018 (48)	.	.	91%	2019 (June)	98%	0%	0%	88%
2018 (P)	2019 (53)	.	.	.	2020 (July)	.	.	.	.
2019 (Q)	2020	.	.	.	2021 (July)	.	.	.	.
2020 (R) Heifer	2022 (43)	500kg BCS 3.5	80%	95%	2023 (Aug)	99%	0%	0.6%	93%

This producer has significantly improved his heifer conception rates from baseline levels of 53% to 84%. Involvement with the PDS brought the producer into contact with vets and consultants early in the project and raised his awareness to potential issues with worms. The producer started working with veterinarian, Sean McGrath to develop an annual comprehensive animal health program. This has involved working out what animal health treatments to give animals at what time, as well as the discipline to better monitor cattle BCS and give nutritional supplements where required. Having a sole cattle enterprise and higher stocking rates, he had suspected his worm burden had increased on the property and that it was contributing to lower weaner growth rates.

At weaning, heifers receive 7 in 1 and Pestiguard vaccinations, whilst steers receive a 5 in 1 vaccination. All weaners are now treated with an injectable worm drench, whereas previously only pour-on backliners had been used. Weaners now also receive copper, cobalt and selenium injections three to four times per year in response to veterinary advice based on known deficiencies of these trace elements in the region.

Farm 7

Farm 7 is an autumn calver and has kept good reproductive records, so was able to provide good baseline data in addition to monitor mob data, as well as contributing to a case study. This producer runs a self-replacing Hereford Angus x Simmental herd and regularly works with private livestock consultants, including Sean McGath, veterinary consultant involved within the project.

Table 21 – Farm 7 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned October 2020, (average liveweight 270 kg)

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 350-380kg) BCS 3-3.5	Average daily gain (ADG) joining	Heifers PTIC	Calving (Average lwt 550kg, BCS 3)	2nd joining (Average lwt 560kg BCS 3.0-3.5)	ADG joining	Calving
700	12th May - 22nd June 2021	73g /hd/day	20th Aug 2022	19th Feb 2022 (Start)	19th May -30th June 2022		26th Feb 2023 (start)
FOO kg DM/ha	2200 kg			1500 kg	1800-2200kg		1500 kg
Pasture quality	Med-high			Ryegrass, cocksfoot, strawberry clover 6MJ	Very high quality green sub-clover		High quality
ME requirements (MJ ME/kg DM)	53			152	167		
Supplementary feeding	Apply urea and pro-gibb			Lucerne chicory clover pasture hay every 3 days			Balansa hay

Figure 8 – Farm 7 feed on offer following joining (July 2021)

Table 22 – Farm 7 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2017 (N)	2018 (66)	320kg BCS 3.0	46%	98%	2019 (Mar)	91%	11.5%	1.9%	53%
2018 (P)	2019 (65)	320 kg BCS 2.0	46%	79%	2020 (Mar)	93%	5%	3.7%	71%
2019 (Q)	2020 (48)	320 kg BCS 3.0	46%	83%	2021 (Mar)	90%	1.5%	0.8%	50%*
2020 (R) Heifer	2021 (41)	350kg BCS 3.5	50%	77%*	2022 (Mar)	98%	2.9%	0%	43%**
2021 (S) Heifer	2022 (42)	320kg BCS 3.0	46%	87%	2023 (Mar)	93%	2.3%	0%	81%

**Noticed abortions, **PTIC heifers sold before calving*

Table 23 – Farm 7 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019 (42)	560kg BCS 2.0	80%	95%	2020 (Feb)	96%	1%	2.1%	90%
2018 (P)	2020 (42)	560kg BCS 4.0	80%	88%	2021 (Feb)	81%*	0%	0%	80%
2019 (Q)	2021 (42)	560kg BCS 3.0	80%	81%	2022 (Feb)	99%	1%	0%	77%
2020 (R) Heifer	2022 (38)	560kg BCS 3	80%	90%	2023 (Feb)	98%	0%	0%	88%

**No dead calves (early abortions?)*

This farm has had variable results due to some issues with dystocia, reproductive diseases causing abortions and the use of AI which has sometimes produced variable results. Working with veterinary consultant along with involvement within this group has enabled this business to continue to fine-tune their beef breeding enterprise to achieve exceptional results over the last couple of years, in particular 87% heifer conception rates for 2021 drop heifers and a subsequent 81% weaning rate to heifers joined.

Farm 8

Farm 8 is a spring calver and has contributed good baseline and monitor mob data and has excellent records. This business has a self-replacing Angus and Shorthorn herd and has exceptional heifer conception rates ranging from 81 to 88%, with re-conception rates between 88 and 94%. This is potentially due to animals entering joining after the spring flush in excellent body condition scores (3.0 to 4.0) and joining on an average of 2000kg of very high-quality pasture. There is a high percentage of assisted calving's in heifers (13 to 17.5%), however there was a very low heifer mortality (0-1.7%), indicating that early intervention is practiced.

Table 24 – Farm 8 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned 20th March 2021 (average liveweight 220kg)

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Average lwt 400kg BCS 3.5)	Average daily gain (ADG) joining	Heifers PTIC (Average lwt 450kg, BCS 3.0)	Calving (Average lwt 500kg, BCS 3.0)	2nd joining (Lwt range 550-600kg BCS)	ADG joining	Calving
700 kg	4th Nov-15th Dec 2021	Increasing	9th Feb 2022	14th Aug 2022 (Start)	1st Nov-13th Dec 2022	Increasing	11th Aug 2023 (start)
FOO kg DM/ha	2000 kg		3000 kg	2000 kg	2000 kg		0 kg
Pasture quality	Very high, spring quality		Wheat grass and Phalaris, 3.5 MJ	Very high	Very high		
ME requirements (MJ ME/kg DM)	53		53		167		167

Table 25 – Farm 8 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2018 (P)	2019 (42)	330kg BCS 3.0	51%	81%	2020 (Aug)	86%	13.5%	0%	69%
2019 (Q)	2020 (42)	330kg BCS 3.0	51%	86%	2021 (Aug)	90%	9.8%	1.0%	77%
2020 (R) Heifer	2021 (42)	400kg BCS 3.5	57%	88%	2022 (Aug)	87.5%	13%	0.8%	76%
2021 (S) Heifer	2022 (42)	350kg BCS 3.5	50%	87%	2023 (Aug)	83%	17.5%	1.7%	81%

Table 26 – Farm 8 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019 (42)	.	.	90%	2020 (Aug)	91%	0%	0%	83%
2018 (P)	2020 (42)	.	.	88%	2021 (Aug)	95%	0%	1.1%	83%
2019 (Q)	2021 (42)	520kg BCS 4.0	74%	92%	2022 (Aug)	94%	0%	0%	87%
2020 (R) Heifer	2022 (42)	500kg BCS 3	71%	94%	2023 (Aug)	98%	0%	0%	92%

Farm 9

Farm 9 runs pure Herefords in a self-replacing, spring calving operation. Once again, the spring calving seems to have contributed to excellent heifer conception rates between 78% and 84%, with re-conception rates of 90 to 97%. However, the requirement for assistance at calving is again high (10 to 21%) and heifer mortality varying between 0 and 3%.

Table 27 – Farm 9 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned May 2021

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Average lwt 388 kg BCS 3.0)	Average daily gain (ADG) joining	Heifers PTIC (Average lwt 423kg, BCS 3.0)	Calving	2nd joining (Average lwt 550kg BCS 3.0)	ADG joining	Calving
650 kg	22nd Oct – 4th Dec 2021	Increasing	15th March 2022	1st Aug 2022 (Start)	26th Oct-8th Dec 2022	Increasing	5th Aug 2023 (start)
FOO kg DM/ha	3000 kg		3000 kg	1500 kg			
Pasture quality	High		Low quality, 4 MJ	Very high Phalaris, sub clover	High		Very high Phalaris, sub clover
ME requirements (MJ ME/kg DM)	53		53		152		167
Supplementary feeding			Silage and hay				

Figure 9 – Farm 9 feed on offer prior to joining (July 2021)

Table 28 – Farm 9 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2017 (N)	2018 (42)	400kg BCS 3.0	62%	84%	2019 (Aug)	92%	18.5%	0%	78%
2018 (P)	2019 (42)	400kg	62%	78%	2020 (Aug)	97.6%	21%	2.4%	76%
2019 (Q)	2020 (42)	.	.	.	2021 (Aug)	.	.	.	.
2020 (R) Heifer	2021 (42)	388kg BCS 3.0	60%	83%	2022 (Aug)	88%	17.6%	0%	68%
2021 (S) Heifer	2022 (42)	.	.	80%	2023 (Aug)	97%	10%	3%	73%

Table 29 – Farm 9 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019 (42)	550kg	85%	90%	2020 (Aug)	98%	0%	0%	89%
2018 (P)	2020 (42)	.	.	.	2021 (Aug)	.	.	.	.
2019 (Q)	2021 (42)	.	.	.	2022 (Aug)	.	.	.	.
2020 (R) Heifer	2022 (38)	550kg BCS 3	85%	97%	2023 (Aug)	100%	0%	0%	97%

Farm 10

Farm 10 is also a spring calving operation and utilises hybrid vigour in a self-replacing Angus x Black Simmental breeding herd. Excellent conception rates for 2020 and 2021 drop heifers of 87 to 90% and subsequent 81 to 89% weaning rates to heifers joined were achieved. Re-conception rates were slightly lower compared to some of the other businesses at 84%, likely due to the lower BCS of 2.5 at joining for the monitor mob.

Dystocia and the need for assistance was still quite high at 4.2 to 8.3%, but again with low heifer mortality of 0.8%. This producer had a theory that the later calving heifers were causing more trouble at calving, so is using foetal aging to manage these separately, or even sell those heifers calving in the second cycle. For the monitor mob, heifers that conceived in the first cycle (earlies) were 411 kg at joining, lates were the heaviest at 432kg, and the dries weighing the least at 382kg.

Table 30 – Farm 10 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned February 2021 (average liveweight 235kg)

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Average lwt 374 kg BCS 3.0)	Average daily gain (ADG) joining	Heifers PTIC (Average lwt 423kg, BCS 3.0)	Calving (Average lwt 430kg, BCS 3.5)	2nd joining (Average lwt 450kg BCS 2.5)	ADG joining	Calving
650 kg	23rd Oct – 14th Dec 2021	Increasing	15th Feb 2022	2nd August 2022 (Start)	30th Oct-14th Dec 2022	Increasing	9th August 2023 (start)
FOO kg DM/ha	4000 kg		500 kg				
Pasture quality	Very high spring quality		Low (4 MJ ME/kg DM)				
ME requirements (MJ ME/kg DM)	53		57	122	154		
Supplementary feeding			Wheaten hay, ryegrass and clover silage				

Table 31 – Farm 10 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2020 (R) Heifer	2021 (52)	374kg BCS 3.0	58%	87%	2022 (Aug)	94%	8.3%	0.8%	81%
2021 (S) Heifer	2022 (52)	380kg BCS 3.0	58%	90%	2022 (Aug)	98%	4.2%	0.8%	89%

Table 32 – Farm 10 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2020 (R) Heifer	2022 (45)	450kg BCS 2.5	69%	84%	2023 (Aug)	97%	0%	0%	82%

Farm 11

Farm 11 is an autumn calver with a self-replacing Angus and Simmental x Hereford herd. This producer had excellent heifer conception rates of 87 and 86% for 2020 and 2021 drop heifers, with re-conception rates of 95% for 2020 drop heifers. Heifer mortality was the highest at 6.3% for the monitor mob, with some metabolic animal health issues reported, but had 0% mortality for the 2021 drop heifers.

Table 33 – Farm 11 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Average lwt 341 kg)	Average daily gain (ADG) joining	Heifers PTIC	Calving	2nd joining (Average lwt 575 kg)	ADG joining	Calving
650 kg	11th June-2nd August 2021	Increasing	2022	21st March 2022 (Start)	10th June-20th June 2022	Increasing	20th March 2023 (start)
FOO kg DM/ha	1200						
Pasture quality	Very high						
ME requirements (MJ ME/kg DM)	53				183		

Figure 10 – Farm 11 feed on offer during heifer joining (July 2021)

Table 34 – Farm 11 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2020 (R) Heifer	2021 (52)	341kg	52%	87%	2022 (April)	94%	0%	6.3%	62%
2021 (S) Heifer	2022 (46)	385kg	59%	86%	2023 (April)	91%	0%	0%	77%

Table 35 – Farm 11 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2020 (R) Heifer	2022 (56)	575kg BCS	88%	95%	2023 (April)	87%	0%	0%	92%

Farm 12

Farm 12 is an autumn calver with Angus, Hereford and Speckle Park breeding cattle. This farm has limited data available, however monitor mob heifer conception rates were between 77 and 87%, with re-conception rates between 78 and 92%.

Table 36 – Farm 12 key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned November 2021

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 360-370kg BCS 3.0-3.5)	Average daily gain (ADG) joining	Heifers PTIC	Calving (Average lwt 490kg, BCS 3.0-3.5)
650 kg	30th May – 19th July 2021	Maintain 200g /hd/day	9th Sept 2021	9th March 2022 (Start)
FOO kg DM/ha				2000kg during calving, shifted to 3500kg after calving.
Pasture quality				Low (5-7MJ ME/kg DM)
ME requirements (MJ ME/kg DM)	53		57	137
Supplementary feeding				4.6kg /hd/day during calving First cut lucerne ryegrass hay, ME 8.7 MJ

Table 37 – Farm 12 heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2018 (P)	2019 (67)	.	.	87%	2020 (March)	97%	.	.	79%
2019 (Q)	2020 (50)	.	.	77%	2021 (March)	97%	.	.	51%
2020 (R) Heifer	2021 (50)	360kg BCS 3.5	55%	82%	2022 (March)	94%	4.9%	0%	61%

Table 38 – Farm 12 second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019 (76)	.	.	78%	2020 (March)	95%	0%	0%	70%
2018 (P)	2020 (76)	.	.	92%	2021 (March)	97%	0%	0%	86%
2019 (Q)	2021 (65)	.	.	87%	2022 (March)	100%	0%	0%	87%

4.2 Summary of combined producer data

The following tables show the combined data from the 12 producers who submitted baseline data along with monitor mob data and subsequent 2021 heifer reproduction data. Table 39 shows that producers have increased the liveweights of heifers at joining from 52% of the standard reference weight of mature cows in 2017 drop heifers to 58% in 2021 drop heifers. This is closer to the recommended target of 60% to achieve 85% conception rates in a six-week joining. Conception rates for heifers for the monitor mob was 81%, with a moderate increase to 84% in the 2021 drop heifers which meets the standard for good heifer conception rates.

It is important to note that the monitor mob heifer conception rates were 80%, 79% and 86% for autumn, winter, and spring calving systems respectively, and that subsequent conception rates for 2021 drop heifers were 85%, 80% and 86% respectively for autumn, winter, and spring calving systems. This indicates that the autumn calving systems may have benefited the most from better meeting target joining weights, whilst the winter and spring systems remained relatively stable. This agrees with the linked R&D project recommendation that liveweight at the start of joining is more critical for autumn calving systems, due to having lower pasture availability and low growth rates of livestock during joining through winter. The spring calving systems within this project achieved the best heifer conception rates, however also had the highest levels of heifers needing assistance at calving, although preventative management meant there was very low mortality rates.

Table 39 – Summary combined producer heifer data (2017 to 2021 drop heifers)

Year of drop	Joining year (join length)	Av. lwt 1st joining	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2017 (N)	2018	342kg	52%	83%	2019	73%	13%	2.7%	82%
2018 (P)	2019	349kg	53%	76%	2020	93%	6.4%	1.3%	68%
2019 (Q)	2020	353kg	53%	80%	2021	90%	6.6%	0.4%	59%
2020 (R)	2021	372kg BCS 3.3	56%	81%	2022	93%	8%	0.8%	67%
2021 (S)	2022	380kg	58%	84%	2023	94%	4%	0.6%	74%

Table 40 – Summary combined producer second calving data (2017 to 2020 drop heifers)

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019	518kg	80%	88%	2020	96%	1%	1.3%	82%
2018 (P)	2020	534kg	82%	88%	2021	94%	1%	0.5%	85%
2019 (Q)	2021	550kg	85%	88%	2022	98%	0.7%	0%	85%
2020 (R)	2022	523kg	85%	92%	2023	98%	0%	0.6%	89%

To optimise re-conception, the target liveweight for heifers leading into their second calving is 85% to 90% of the mature cow reference weight. A BCS of 3 and high-quality feed on offer will also contribute to re-conception success. Within this dataset, there was a slight increase from 80% of mature reference weight in 2017 drop heifers to 85% in 2019 and 2020 drop cows.

Despite most producers saying that they wanted to lift conception rates in second calving cows at the initial planning meeting in December 2020, baseline data indicates that re-conception rates were already quite good at 88%, with weaning percent to cows joined around 82 to 85%. This is potentially due to the fact that these animals get preferential treatment and are often allocated the best feed in the lead-up to the second joining. Within this project, the monitor mob re-conception rates increased by 4% to 92%, with 89% weaning rate to cows joined.

Across all of the producer data, the percentage of calves born alive to cows PTIC (and calved down) was fairly stable around 94% for heifers and 94 to 98% in second calvers.

Most producers within the group are now doing a six-week joining, whilst some are also using foetal ageing to split heifers into 'earlies' and 'lates'.

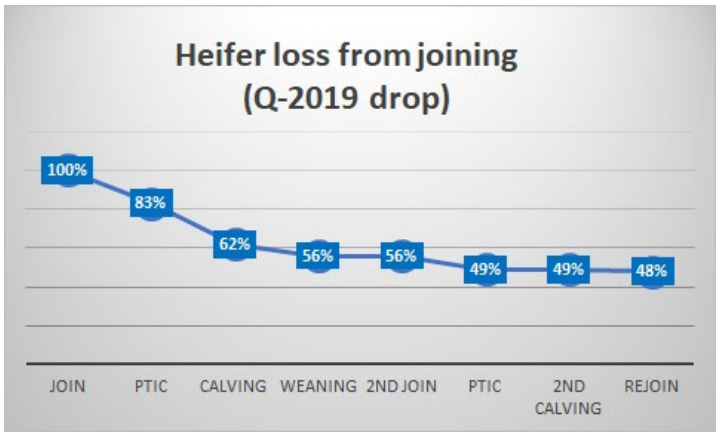
The amount of assistance for cases of dystocia (difficulty calving) was reduced from 13% in 2017 drop heifers to 4% in 2021 drop heifers, with subsequent lower heifer mortality from 2.7% down to 0.6%. For many producers, selecting for shorter gestation and calving ease EBVs has been key to reducing dystocia in heifers, along with low to moderate birth weights.

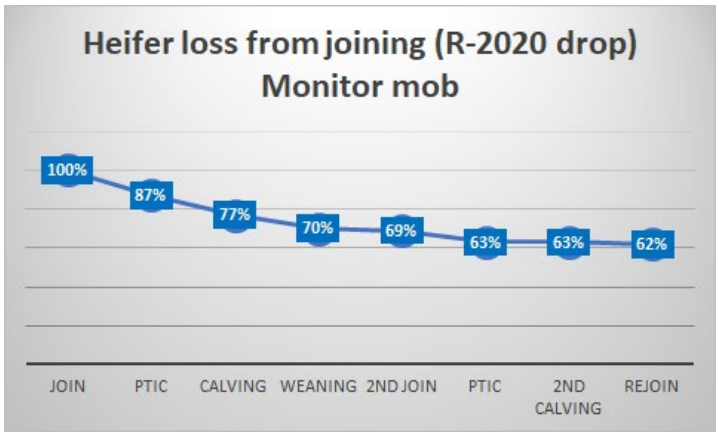
One of the learnings throughout the project was dispelling the myth that limiting feed in heifers prior to calving will reduce birth weights to help prevent dystocia. Peer-to-peer discussions, along with technical presentations indicated that this strategy can often backfire, with heifers lacking energy to push calves out. Heifers need adequate nutrition throughout late pregnancy to sustain their growth rates and milk production, in addition to foetal growth. It's equally important that heifers grow well prior to joining and in the first half of pregnancy, rather than trying to 'catch-up' during the second half of pregnancy, when there's a bigger risk of nutrition increasing calf size.

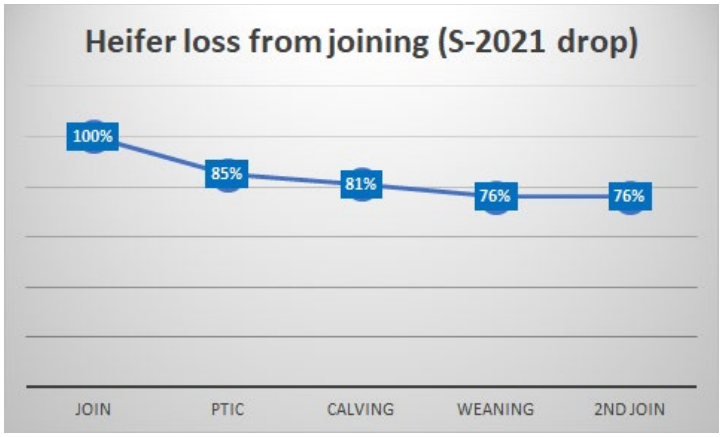
Another important lesson for producers was that many got a shock after weighing their mature cows and finding their mature cow reference weights were a lot higher than expected, which meant the target weights they were using for joining were inaccurate. According to the linked heifer R&D project, reference weight is best obtained two weeks after mature cows' calves are weaned, preferably at body condition score (BCS) 3. Each additional BCS is worth about 70–100kg (depending on breed) so if they are fatter or leaner than BCS 3, the weight can be adjusted accordingly. The average reference weight for the group was around 650kg average, with some breeds closer to 700kg (particularly those utilising hybrid vigour from European breeds such as Simmental).

The linked heifer reproduction R&D project describes 'WAPE' as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of their second joining. Within this project, WAPE has been assessed from joining through to second calving. The following figure (Figure 11) show results from the Beef PDS for the different years of drop, which demonstrates an increase in WAPE from 48% and 57% in baseline levels (2018 and 2019 drops) to 62% in the monitor mob. This is likely to increase further in the subsequent 2021 drop mob, with a 7% increase already seen in the percentage of heifers that managed to conceive for a second time. Very few losses occur after this stage, suggesting that WAPE will be closer to 70% for the 2021 heifer drop within the group.

Figure 11 – Beef PDS combined producer data showing the percentage of heifers in the herd from first joining (100%) through to rejoining after their second calving (2018 - 2021 drops)







4.3 Producer case studies and animal health investigations

4.3.1 Summary of case studies

Producer members in the group were identified on the basis of having adopted certain practices as a result of participating in this project. Full case studies can be found in Appendix 7.1.1 for Farm 2, 4, 6 and 7. Farm 1 case study can be found in Appendix 7.1.7).

Farm 1: Focus on length of joining, EBV's and genetics (MLA Feedback Winter 2023).

Farm 2: Focus on calving time, measuring mature cow reference weight, foetal aging, bull testing, grass tetany prevention and individual liveweight recording.

Farm 4: Focus on fertility, foetal aging and selection of replacement heifers.

Farm 6: Focus on animal health, meeting nutritional requirements, changing calving time, financial benchmarking.

Farm 7: Focus on experience with fixed time AI and hybrid vigour.

4.3.1.1 Farm 1 – Darcy and Chris Bateman, "Cheverton", Furner, SA. "Robust benefits from new insights"

This case study was written by MLA and published in the MLA Feedback Magazine: 26 July 2023, p 36-37. https://www.mla.com.au/news-and-events/industry-news/hot-tips-for-top-heifers/ (Appendix, 7.1.7)

Darcy and Chris Batemen, run a self-replacing herd of 500 autumn calving Hereford x Simmental cross and Angus x Black Simmental breeding cows on 1,400ha at Furner (670 mm annual rainfall).

As a result of their involvement in the project, they now put more emphasis on the "Days to calving" EBV and are tracking their heifer conception rates in relation to the bulls used and their EBV's. They were also encouraged to use a veterinary consultant to do worm egg counts and blood testing in the heifer monitor mob to investigate a case of ill thrift, which turned out to be due to plant toxicity.

More recently, they have trialled a 'split-joining' of four weeks, with a one to two-week break, followed by another three-week joining, with the aim of retaining as many heifers as possible in the first calving cycle to tighten up the spread of calf weights for management and future marketing purposes.

Key messages and lessons learnt:

- Continually monitor heifers to meet their nutritional requirements throughout their reproductive cycle.
- Key profit drivers correlate to different management tools, such as managing stocking rate throughout the year, timely pre-testing and selecting bulls for required genetics.
- Peer-to-peer discussions enabled sharing of experiences around what worked and what didn't work in each other's business.

4.3.1.2 Farm 2 – Peter and Elke Hocking, "Scotglade", Lucindale, SA. "Measure and monitor to fine-tune management"

This case study can be found in Appendix 7.1.1, p89 – 96.

Peter and Elke Hocking run a 310-cow breeding herd at Lucindale (600 mm annual rainfall), purchasing in replacement composite (Simmental x Hereford x Angus) heifers from another family property and calving heifers in autumn and cows in winter. This case study focuses on changing calving time, the importance of measuring mature cow reference weight, the application of foetal aging, fertility testing of bulls, grass tetany prevention and the use of eID for ease of management.

The main benefits from their involvement within the Beef PDS was learning and hearing about other peoples' experiences and being able to pick out which practices would be most suitable to adopt within their own production system.

Key messages and lessons learnt:

- Bull fertility testing prior to joining alleviates poor reproductive performance and 'surprises' following joining.
- Pregnancy testing six weeks following bull removal and foetal aging allows for early identification of dries for marketing and allocation of feed to better match nutritional requirements of pregnant heifers and cows.
- Foetal aging is a useful management tool to reduce the time spent checking calving cows due to having a tight calving period for each mob of cows.
- Having heifers in good body condition score following calving and on high quality pastures through joining enables excellent re-conception rates, even with a short interval post-calving.
- Having a yearly animal health plan is critical for the preventative management of grass tetany, worms, and other diseases.
- The installation of a cattle crush with inbuilt scales and the use of an eID stick reader has made it easy to record liveweights whenever livestock are yarded for other management treatments. The use of 'alerts' on the stick reader has allowed easy drafting of animals on pregnancy status or other traits of interest.
- Having a good understanding of the range in body cow mature reference weights in the herd is critical to be able to calculate their nutritional requirements throughout the year, as well as setting more accurate target joining weights.
- Practicing body condition scoring and pasture assessment at each session reinforced these skills so that they have now become regular management practices throughout the year.
- With a loss of 40% of heifers from the monitor mob (due to an inability to conceive and/or raise a calf) from first time joining through to second calving, adequate numbers of heifers need to be joined initially to ensure there are enough for herd replacement.

4.3.1.3 Farm 4 – Ian Johnson, "Amherst", Willalooka, SA. "Fertility, fertility, fertility"

This case study can be found in Appendix 7.1.1, p97 – 101.

Ian and Louise Johson run a self-replacing autumn calving Angus herd of 6,800 breeding cows on 15,000 ha at Willalooka (480 mm annual rainfall) and Beachport (600mm).

With a goal of reaching 7,000 breeding cows through self-replacing with their own heifers and the purchase of a couple of new properties, reproduction has been the focus for their business. Ian owns two pregnancy scanners, with staff within the business trained to use it for pregnancy diagnosis and foetal aging. Over the next year, Ian wants to find the balance between retaining enough heifers to fulfil his replacement requirements, as well as trying to only keep heifers that conceive in the first four weeks of joining. Armed with information from the Beef PDS project, he is aiming to join around 2,000 heifers to gain 1,200 heifers pregnant in the first four weeks of calving (60%).

Key messages and lessons learnt:

- Wet and pregnant early (WAPE) is a measure that describes a heifer successfully getting in calf, raising a calf and getting back in calf within the first six weeks (two cycles) of joining. Once WAPE is achieved, heifers tend to be productive and robust as mature cows.
- Foetal aging is beneficial to identify those heifers in your herd that are "wet and pregnant early", to condense calving spread to a four-week period as well as having the flexibility to sell surplus late calving heifers, which is particularly useful in unfavourable seasons.
- It is important to know your standard reference weight (SRW) of mature cows to determine target joining weights for heifers. SRW refers to the weight of a grown-out cow, empty at body condition score (BCS) 3.
- Look after heifers prior to their second joining by matching their nutritional requirements to achieve higher re-breeding rates.
- The critical mating weight for heifer joining is 60-65% of the herd's SRW.
- Having a greater proportion of mature cows within the herd will enable better fertility overall, with mature cows achieving 95% conception rates. Understand your herd structure to determine heifer replacement requirements.
- Access credible information from veterinarians and consultants and assess the cost-benefit of animal health treatments within your own business.
- Being involved within a group enables peer-to-peer discussions which challenge your current thought processes around management decisions and motivate you to look closely at what changes are practical within your business and that can improve your productivity and profitability.

4.3.1.4 Farm 6 - Michael Cobiac, "Saltwell Pastoral Co", Reedy Creek, SA. "Fine-tuning management practices pays dividends"

This case study can be found in Appendix 7.1.1, p102 – 109.

Michael Cobiac and Catherine Bell run a self-replacing spring calving Angus herd of 640 breeding cows on 1,100 ha at Reedy Creek (600 mm annual rainfall).

With involvement in a local financial benchmarking group, as well as the Beef PDS, Michael has made some major changes to his enterprise over the last ten years, shifting from a mixed livestock sheep and cattle enterprise to 100% self-replacing Angus beef enterprise and moving his time of calving from February to August.

The Beef PDS project has helped Michael navigate the management changes required from shifting calving times, in particular, the different nutritional requirements in relation to feed on offer at key time periods. One of the key things adopted has been using a veterinary consultant to develop an annual animal health plan for his breeding heifers and cows, along with the addition of liveweight scales to measure and monitor liveweights at key times throughout the reproductive cycle.

Key Messages and lessons learnt:

- Record keeping and data management is useful to make informed decisions to improve productivity and profitability and to identify where the biggest losses are occurring in your system.
- Target weight for heifer joining is 60-65% of mature cow weight.
- Having heavier heifers in better body condition score at joining will result in higher conception rates.
- Understand what your animal nutritional requirements are at any given time during the season.
- Be competent in being able to measure feed on offer and the quality of pastures to ensure livestock nutritional needs can be met, and supplement where required.
- Having an annual animal management and health plan is beneficial, with preventative animal health and nutritional supplementation assisting to achieve target weights and achieve genetic potential.
- Peer to peer learning within producer discussion groups is valuable to realise you aren't the only one who makes mistakes and to see what management practices are working and what's not.
- Being involved in a producer demonstration site allows you to watch and learn from others (both presenters and producers) so that you don't always have to trial everything yourself.
- Changing your management practices, in particular your calving time, has implications throughout the rest of the production system.
- Recognise the need for assistance from consultants, veterinarians and other producers who have experience in the system you are moving to.
- Get your priorities right within your business. Select the things that will give you the biggest bang for your buck and have the biggest impact on your business. Once these things are sorted, then identify what other opportunities there are to improve productivity and profitability.

4.3.1.5 Farm 7 – Graeme and Tyson Smith, "Rivoli", Redelsham, SA. "Insights into maximising hybrid vigour and herd fertility in a self-replacing beef herd"

This case study can be found in Appendix 7.1.1, p110 – 116.

Graeme and Tyson Smith run an autumn calving self-replacing herd of 750 composite (Hereford, Angus, Simmental) breeding cows at Redelsham (670-700 mm annual rainfall).

They have consistently prioritised fertility and actively integrate new research and ideas into their management strategies, including the use of artificial insemination (AI) since the 1970's. Over the last few years, they have condensed calving to a six-week period and utilised foetal aging to further fine tune their management. One of the most significant learnings from participating in the project, was the interaction with the University of Adelaide's Wayne Pitchford and learning more about the importance of heifers being "wet and pregnant early" and the value of heterosis (hybrid vigour), attributing to higher growth rates in progeny and improved maternal traits in dams.

Key Messages and lessons learnt:

- Crossbreeding capitalised on hybrid vigour, where offspring exhibit superior genetic traits and overall robustness compared to their parents.
- BREEDPLAN is an integral part of choosing bulls and making genetic gains.
- Foetal aging is done six weeks after bulls are taken out and is a useful tool to separate cycles to improve pasture management, supplementary feeding and oversee the right mobs when calving. In this system foetal aging is also used to separate the heifers that conceived during the AI program, which is useful to group progeny from different sires.
- Using two rounds of artificial insemination on a commercial herd did not result in a positive return on investment. It increased the number of times yarded, injected, and mustered during joining, increasing stress on the people managing the insemination and the heifers.
- Urea and ProGibb applied five to six weeks before joining is a useful tool to increase feed on offer (FOO) throughout joining in May.
- Pasture management and being flexible to set stock versus rotationally grazing is important to get the most out of pastures.
- The critical mating weight for heifer joining is 60-65% and for a second calver joining is 80-85% of the herd's standard reference weight.
- Being involved within a group enables peer-to-peer discussions which provokes alternative thinking around management decisions to improve overall productivity and profitability.
- Accessing credible information from veterinarians, researchers and consultants is critical when making changes to management, and to reaffirm you've made good decisions by trying new practices.
- Hybrid vigour increases the growth rates of progeny and improves maternal traits in dams. Graeme and Tyson learned you can keep the sire from a Black Baldy dam cross Black Simmental sire and breed from them. They will incorporate this into their breeding plan this year.

4.3.2 Animal health case study disease investigation

4.3.2.1 Farm 1

Five to six heifers within the monitor mob were identified as having severe weight loss compared to the rest of the mob, at the pre-joining period in May 2021. There was a history of access to the plant Lesser loosestrife (Lythrum hyssopifolia), which is known to be toxic to animals. Bloods and faeces were collected for testing for liver and kidney markers, trace elements and worm burden markers.

Table 41 - Results of blood tests for kidney biochemistry markers (Farm 1)

Biochemical Marker	Normal range	Animal 1	Animal 2	Animal 3	Animal 4	Animal 5
UREA	2.1-10.7 mmol/L	8.8	42.5 (H)	22.1 (H)	34.7 (H)	37.5 (H)
CREATINE	0-186 umol/L	159	702 (H)	326 (H)	664 (H)	508 (H)
PHOSPHATE	0.80-2.80 mmol/L	3.24 (H)	3.76 (H)	2.31	2.86 (H)	2.94 (H)

H = high levels.

Table 42 - Results of blood tests for trace elements and worms (Farm 1)

Biochemical Marker	Normal range	Animal 1	Animal 2	Animal 3	Animal 4	Animal 5
Glutathione Peroxidase GSH Px (Selenium Marker)	40-300 U/gHB	244	233	197	203	149
Copper	7.5-16 umol/L	15.4	9.1	9.5	14.2	8.3
Vit. B12	200-500 pmol/L	327	997 (H)	402	463	602 (H)
Pepsinogen (indicative of worms)	0.0-5.0 U/L	8.7 (H)	11.8 (H)	11.8 (H)	14.3 (H)	17.2 (H)

H = high levels.

The biochemistry markers for kidney function were all high, which indicates some excessive kidney damage. This is consistent with toxicity from the Lessor loosestrife plant and ingestion of that plant.

The trace elements levels were adequate in these animals. The pepsinogen marker that indicates the worm burden was high in all animals, which indicates a significant worm burden.

The cause of ill thrift in these heifers was a combination of kidney damage due to toxicity from the Lesser loosestrife ingestion and a moderate burden of Ostertagia worms. This was likely to have had a negative impact on heifer fertility, with 72% conception rates achieved.

The recommendation for managing the ill thrift in this case was to drench the mob of heifers. Due to the toxic nature of the kidney insult, there was little that could be done for that part of the problem, except to ensure general nutrition was good and trace element and worm burdens were controlled. In future, trying to prevent access to the weed is all that can be done. In terms of worm burden, Worm Egg Count monitoring four to six weeks after the autumn break will help to identify the mob has a burden that is significant enough to warrant drenching.

The producer drenched the mob and moved the monitor mob heifers to a paddock with more feed on offer and of higher quality to recover prior to joining.

4.3.2.2 Farm 2

Heifers had been recently moved onto a different property within the farming business. The monitor mob were pre-calving, and some were noted to be in lower body condition score (ill thrift) in May 2022. One was clinically sick with some nasal discharge, high temperature and blood-tinged urine. Blood and faecal samples were taken to investigate mob-based causes of ill thrift such as trace element deficiency and worm burden. Testing for infectious diseases was also done to investigate the cause of the clinically unwell animal exhibiting signs such as nasal discharge and bloody urine. The diseases tested for were Leptospirosis, Infectious Bovine Rhinotracheitis (IBR) and Bovine Viral Diarrhoea (BVD) also known as Pestivirus. Testing in the individual sick animal was also done to measure liver function.

Table 43 - Results of blood tests on clinically sick animal for liver biochemistry markers (Farm 2)

Biochemical Marker	Normal range	Test result for clinically sick animal
T. Bil	<10 umol/L	125 (H)
Alk. Phos	<201 U/L	195
GGT	6-17 U/L	296 (H)
AST	78-132 U/L	559 (H)
GLDH	<46 U/L	326 (H)

H = high levels.

On an individual animal level, the clinically sick animal had some level of liver damage, of which the cause is unknown but could be due to a toxic plant ingestion. In terms of infectious diseases, there was no evidence of IBR causing respiratory disease.

Table 44 - Results of blood tests for Leptospirosis, BVD and IBR, Pepsinogen and trace elements (Farm 2)

Biochemical Marker	Animal 1 (sick)	Animal 2 (healthy)	Animal 3 (sick)	Animal 4 (healthy)	Animal 5 (healthy)
Leptospirosis hardio	Positive Titre 400	Positive Titre 400	Positive Titre 800		
Leptospirosis pomona	Negative	Negative	Negative		
BVD persistently infected animal test (PI)	Negative	Negative	Negative		
BVD exposure antibody test	Positive Titre 2+	Positive Titre 3+	Positive Titre 1+		
IBR	Negative	Negative	Negative		
Pepsinogen (indicative of worms) 0.0-5.0 U/L	42.1 (H)	21.6 (H)	6.3 (H)	3.6	2.7
Glutathione Peroxidase (Selenium marker) 40-300 U/g Hb normal range	300	229	312	299	299
Copper 9-20 umol/L normal range	16.6	23.5 (H)	12.2	9.5	7.4 (L)
Vitamin B12 (Cobalt) 130-500 pmol/L normal range	*	459**	178**	384	336

H = high levels. L=low levels.

Table 44 shows there was evidence of Leptospirosis exposure in these animals, however it is difficult to know how recent the infection was and whether this was the cause of the problem. It is proof however that the disease is on the farm and so vaccination would be prudent. None of the animals

were persistently infected (carriers), but they all had evidence of exposure to BVD. This means that BVD is present in the herd, however it's contribution to problems is unclear.

In terms of production limitation, Table 45 shows there was evidence of worm burdens in some animals, which was contributing to the ill thrift. In some animals from another mob (animals 4 and 5), there was also evidence of copper deficiency, which can also cause ill thrift in growing animals.

Table 45 - Results of worm egg count monitor mob (Farm 2)

Mob ID	Strongyle eggs per gram (epg)	Nematodirus epg	Total epg
HEIFERS	135	0	135

To address ill thrift of those in the group, a drench treatment and copper treatment were recommended. Regarding infectious diseases, vaccination with 7 in 1 was recommended, which covers standard clostridial bacteria as well as Leptospira bacteria. Pestivirus vaccination was not recommended but is something that requires further discussion to set a whole farm plan.

4.3.2.3 Farm 3

Heifers from the monitor mob were identified as having excessive weight loss post calving in April 2022, leading into the re-joining period. Blood samples were taken to measure trace elements, worm burdens and BVD status (Table 46).

For trace elements, the results could be seen as adequate, however the selenium levels are in the low end of the range, as are some of the copper levels. This would indicate that supplementation may be beneficial for a growth response. There were very high pepsinogen levels, which indicates a significant worm burden, which is the likely cause of the weight loss. The BVD results indicate there is low level of exposure to the virus in these animals and so they are susceptible to infection. This could be a risk as they were coming into a period of joining, and infection during gestation can lead to significant economic losses.

A recommendation to drench the group of heifers was made. Trace element supplementation would also be worthwhile. In terms of BVD, this group should be vaccinated prior to their next joining to minimise the risk of reproductive losses, however BVD management also needs to be considered at a whole of herd basis, rather than on individual mob status.

Table 46 - Results of blood tests for BVD, Pepsinogen and trace elements (Farm 3)

Biochemical Marker	Animal Tag 79	Animal Tag 40	Animal Tag 78	Animal Tag 833	Animal Tag 5	Animal Tag 837
BVD exposure antibody test	Negative	Negative	Negative	Positive Titre 1+	Negative	Positive Titre 2+
Pepsinogen (indicative of worms) 0.0-5.0 U/L	8.6 (H)	25.2 (H)	11.2 (H)	40.9 (H)	12.6 (H)	30.6 (H)
Glutathione Peroxidase-GSH Px (Selenium marker) 40-300 U/g Hb normal range	86	160	110	89	82	98
Copper 9-20 umol/L normal range	15.6	15.2	11.8	11.4	12.6	8.8 (L)
Vitamin B12 (Cobalt) 130-500 pmol/L normal range	298	419	351	242	281	336

H = high levels. L=low levels.

4.3.2.4 Farm 4

The farmer was trying to decide if a mob of heifers required vaccination for BVD pre-joining, as is recommended in some industry circles. Blood samples were taken from a representative sample of the group to assess the existing status of immunity of the animals. As they were accumulated from multiple properties within the farming business, they were bled in groups from their property of origin to enable trace back to those properties in case there was evidence that one may be worse than the other.

24 serum samples were tested for Bovine Pestirus antibody ELISA, of which 22 of the 24 tested were antibody positive for BVD and two were negative. This indicates that the majority of the mob has been exposed to the virus and are therefore already carrying immunity.

There was no need to vaccinate this group of animals for BVD. There is obviously BVD present in the breeding herd, and so future management of the virus must be taken on in light of this. Annual testing of heifers pre-joining is an effective tool to reduce the need for vaccination and assess the risk to heifers leading into their first joining. This process can also be used to reduce the numbers of persistently infected (PI carrier) animals, should the producer wish to follow that path.

After budgeting the cost of two Pestivirus vaccine doses to 1,800 heifers compared to a few dry heifers, the producer made the decision not to vaccinate.

Key Messages and lessons learnt from animal health case studies including farms 1-4:

- Weight loss or ill thrift in heifers can occur throughout their early reproductive life. If this coincides with a key time point, that being pre-joining, pre-calving or post-calving, there is a potential for reduced reproductive performance.
- Body weight and body condition score underpin reproductive performance and so anything that effects these in a growing female at critical points can reduce reproduction.
- In growing animals, the most common cause of weight loss is an intestinal worm burden. In the region the farms were located, there can be significant trace element deficiency, which can affect growth and was seen in some animals.
- Infectious diseases, primarily Bovine Viral Diarrhoea (BVD), was found to be present in farms that were tested. However, the level of exposure varied between properties and even the different ages of heifers. Blood testing for exposure was able to demonstrate the level of risk that was present in the different groups. Testing was done leading into joining periods which are the higher risk period for production losses and so decisions on whether vaccination was required could be made.
- Monitoring and investigating weight loss or ill thrift that leads to missing body weight targets leading into critical reproductive timepoints is important to ensure good reproductive performance.
- Having preventative animal health plans in place, such as worm monitoring and control, trace elements supplementation and infectious disease monitoring or vaccination, can all contribute to good reproductive performance.
- Good worm control can assist in ensuring heifers are growing as well as they can to ensure they reach critical live weight targets for joining and calving.

4.4 Beef profit drivers

4.4.1 Maternal productivity decision support tool

This tool was trialled by Farm 5 to produce the following gross margin. Note that it was done for the 2022 year when prices were at an all-time high, before they dropped throughout 2023.

Figure 12 – Maternal productivity decision support tool: Farm 5 inputs

Model Inputs

Farm area (ha) 2000

Stock category	Numbers on hand	Numbers sold	Sale Values	
10yo cows	35	5	2205	
9yo cows	40	5	2205	
8yo cows	45	7	2205	
7yo cows	70	10	2205	
6yo cows	80	20	2205	
5yo cows	90	30	2205	
4yo cows	100	30	2205	
3yo cows	130	37	2205	
2yo cows	193	45	2205	
heifers	283	73	3822	Sold PTIC
		46	2244	Sold PTE
Heifer calves	0	33	858	
Steer calves	207	451	1801	
bulls	48	10	2035	

No of bulls purchased	4
No of heifers required as replacement	336
Calving %	85%
Supplementary feed (t)	0
Supplementary feed price ($/t)	0
Pasture costs	136575
Gross Margin/ha	**$ 628.42**
Gross Margin/cow	**$ 998.29**

Figure 13 – Maternal productivity decision support tool: stock trading statement

STOCK TRADING STATEMENT FOR Farm 5 for Year Ending 31-Dec-22 Compiled t Farmer 5

STOCK	OPENING			BIRTHS	PURCHASES			TSFRS IN	% COWS	SALES			TSFRS OUT	DEATHS	CLOSING		
CATEGORY	NO	$/HD	TOTAL		NO	$/HD	TOTAL	NO	SOLD	NO	$/HD	TOTAL	NO	NO	NO	$/HD	TOTAL
BEEF				85%													
10yo cows	35		0					42		5	2205	11025			0		0
9yo cows	48	1200	57600					40	10	5	2205	11025	42	1	40	1200	48048
8yo cows	48	1200	57600					54	15	7	2205	15435	40	1	54	1200	64440
7yo cows	65	1200	78000					54	15	10	2205	22050	54	1	54	1200	64200
6yo cows	75	1200	90000					53	27	20	2205	44100	54	2	53	1200	63960
5yo cows	85	1200	102000					58	35	30	2205	66150	53	2	58	1200	69840
4yo cows	90	1200	108000					90	33	30	2205	66150	58	2	90	1200	108480
3yo cows	130	1100	143000					144	28	37	2205	81585	90	3	144	1100	158554
2yo cows	193	1000	193000		19	0		336	23	45	2205	99225	144	4	269	1000	269000
heifers	283	1000	283000		22	0		287	42	119	3212.02	382230	336	6	398	1000	398000
weaners	0		0					287				0	287		0		0
Heifer calves	0		0	327	96	0			10	33	858	28314	287	6.5365	0	1000	0
Bull calves	207	1000	207000	327						451	1801	812251		6.5365	76	1000	76289
bulls	48	2500	120000		4	16800	67200			10	2035	20350			42	2500	105000
TOTAL	1307		1439200	654	141		67200			802		1659890		33	1279		1425811

Figure 14 – Maternal productivity decision support tool: Farm 5 gross margin

GROSS MARGIN BUDGET						for Year Ending		2022
ENTERPRISE ADULT ANIMALS		QTY/ HEAD		Head or other *	TOTAL QUANTITY		UNIT PRICE		TOTAL
CLOSING VALUATION									1425810.50
SALES:									1659890.00
SUB-TOTAL (a)									3085700.50
LESS									
OPENING VALUATION									1439200.00
LIVESTOCK PURCHASES									67200.00
SUB-TOTAL (b)									1506400.00
GROSS OUTPUT (a-b)									1579300.50
LESS VARIABLE COSTS:									
FEED TRANSFERED/PURCHASED:									
Hay			kg		0	t	0	/t	0.00
Blocks/minerals				1307			5	/hd	6535.00
VACCINE:									
7 IN 1	cows	2	ml	0			0.76	/dose	0.00
	calves	4	ml	653.65	2		0.76	/dose	993.55
DRENCH:									
	cows			0			8.76	/hd	0.00
	calves			653.65			2.5	/hd	1634.13
TRANSPO	STOCK				743	hd	30	/hd	22290.00
STOCK SELLING CHARGES					1659890		5.5	%	91293.95
LEVIES					802	hd	5	/hd	4010.00
R&M/Fuel				0	0		17	/hd	14060.00
WATER				0	0		25	/hd	10000.00
MISC.				0			0.5	/hd	35000.00
INSURANCE					30000		2	/$1000	60.00
VARIABLE COSTS - before forage costs									185876.62
ENTERPRISE GROSS MARGIN - before forage costs									1393423.88
LESS ALLOCATED FORAGE COSTS									136575.00
GROSS MARGIN (Including forage costs)									1256848.88
GROSS MARGIN PER HECTARE									628.42

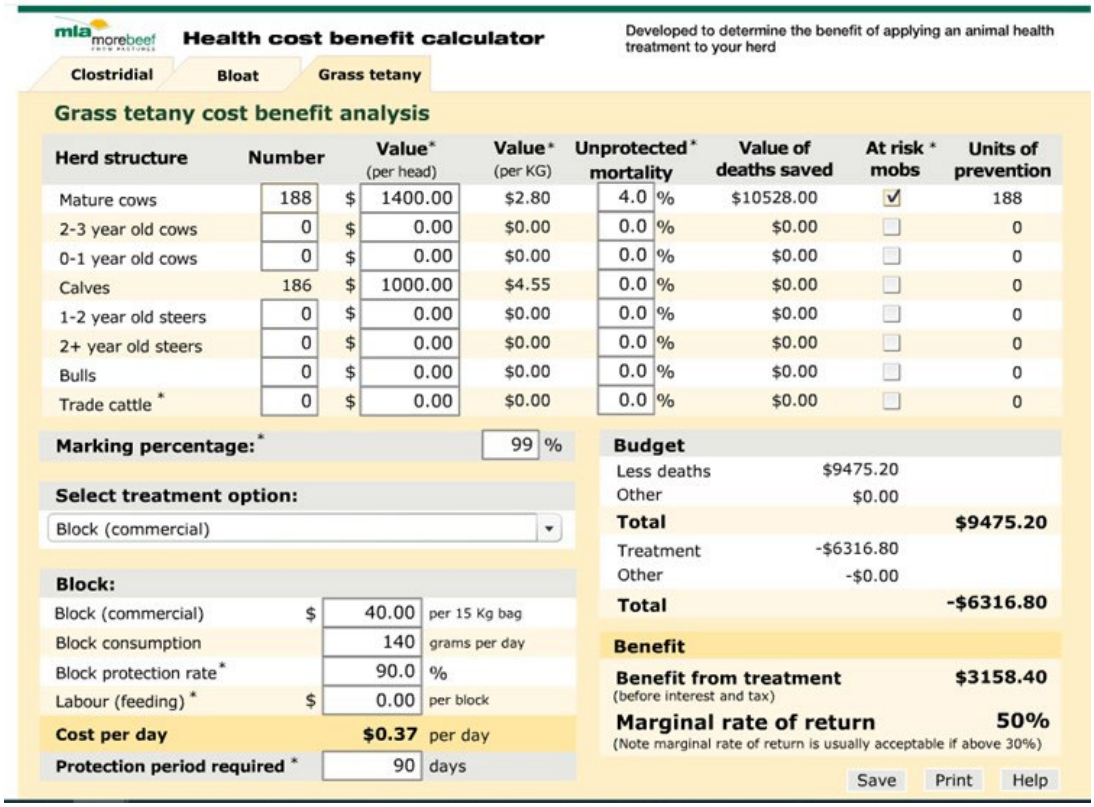
Producers within the group were encouraged to have a go at entering their own data into the spreadsheet, however most found it too complicated to navigate and so it wasn't utilised. Discussion amongst the group suggested that the calculator was just a retrospective gross margin tool rather than a tool that could be used to make future business decisions.

4.4.2 MLA health cost benefit calculator

This calculator was used in the case study for Farm 2 to determine the cost effectiveness of using mineral blocks for the prevention of the metabolic condition of Grass Tetany. This beef enterprise has seen previous mortality rates from Grass Tetany as high as 8% within certain mobs and since then has conducted preventative management strategies including provision of hay and mineral blocks during peak risk periods (lactating cows in cold weather conditions grazing on less than 1200 kg DM per ha).

Calving in June and July, $6,300 was spent on mineral blocks and put out during June through to August (90 days) to 188 breeding cows. Figure 15 below shows the return on investment was 50%, assuming that cow sale values are around $1,400 per head and that a 4% loss due to Grass Tetany was prevented through treatment. No labour cost was added since blocks are normally put out when checking calving cows. Note that the c/kg value in the calculator is based on a 500 kg cow and should be modified to allow heavier weight cows to be put into the model.

Figure 15 – MLA Health cost benefit calculator, Farm 2



The sensitivity analysis in Table 47, shows that the break-even point for spending money on Grass Tetany prevention is around 4% mortality rates across the herd and cow values of only $1,000 per head, or alternatively a mortality rate of only 2% with a cow value of $2,000. It is important to note that this value is possibly understated as it doesn't include the loss of growth rate in the orphaned calves which is likely to be higher the younger the calf is when orphaned.

Table 47 – Marginal rate of return sensitivity analysis with different cow values and mortality rates (Farm 2)

	Mortality%				
Cow value / head	**1%**	**2%**	**4%**	**6%**	**8%**
$1,000	-73%	-46%	7%	61%	114%
$1,200	-68%	-36%	29%	93%	157%
$1,400	-62%	-25%	**50%**	125%	200%
$1,600	-57%	-14%	71%	157%	243%
$1,800	-52%	-4%	93%	189%	286%
$2,000	-46%	7%	114%	221%	329%

4.5 Extension and communication

4.5.1 Host farm visits, technical sessions and MFMG livestock field days

The discussion group consisted of 32 producers, representing 19 participating beef businesses, with 18,600 breeding cows within the Limestone Coast region. This group met in person a total of 12 times over the course of the project and visited 11 host properties from within the group (Target=7 host properties and 3 technical sessions with industry / veterinary expert).

Table 48 – Meeting dates, topics and presenters for host farm visits and technical sessions

Meeting date and Session #	Host farm and topics	Technical presenters
Session 1 December 2020	Host: Darryn Simon, Beachport - Planning session to identify topics - Animal health issues - Body condition scoring (BCS) skill development - Pasture assessment skill development	Elke Hocking (Facilitator) Elke Hocking, Emma Peters Sean McGrath James Pitchford Tim Prance
Attendance	*14 producers representing 10 businesses.*	
Session 2 March 2021	Host: Graeme and Tyson Smith, Rendelsham Host: Andrew and Sam Bell, Sebastapol - Calf post-mortem demonstration - Calf scours prevention, diagnosis, and treatment - BCS and pasture assessment	Elke Hocking (Facilitator) Emma Peters Sean McGrath Tim Prance
Attendance	*20 producers representing 15 businesses*	
Session 3 May 2021 *Open to Public	Host: Chris and Darcy Bateman, Furner - BCS and pasture assessment - Veterinary collection of blood samples and faecal samples for animal health investigation of low BCS animals in monitor mob Technical presentation (open to public) - Metabolic diseases around calving and lactation - Management of cattle worms - Drench resistance and worm egg counts - Cattle reproductive and respiratory diseases - Best practice vaccination in cattle	Elke Hocking (Facilitator) Tim Prance, Emma Peters Sean McGrath Andrew Whale, Livestock Logic Gary Glasson, Zooetis
Attendance	*17 producers from 12 businesses attended the farm tour prior to technical session. 21 producers from 14 businesses attended the technical session, plus 8 other people (not within group)*	*10,880 breeders.*
Session 4 December 2021	Host: Michael Cobiac, Reedy Creek - BCS and pasture assessment - Financial benchmarking for beef enterprise Technical Presentation - Genetics: Understanding EBV's workshop - Bred Well Fed Well content - Heifer nutrition for joining and gestation - Reference weights and CS targets for joining - Bull structural soundness and fertility testing.	Elke Hocking (Facilitator) Emma Peters, Tim Prance Host Penny Schulz, Schulz Livestock Sean McGrath Sean McGrath
Attendance	*20 producers from 15 businesses attended. 3 early career professional consultants and 4 consultants were involved.*	*9,030 breeders.*

Meeting date and Session #	Host farm and topics	Technical presenters
Session 5 March 2022	Host: James McKay, Lucindale - BCS and pasture assessment - Rotational grazing Technical presentation - Nutritional requirements of beef cattle - Practical tips for calving and when to call the vet	Elke Hocking (Facilitator) Tim Prance Host Ashlee-Hunt Sean McGrath
Attendance	*24 producers from 15 businesses attended. Additionally, 3 consultants were involved.*	*13,670 breeders.*
Session 6 May 2022	Host: Toby Hassell, Thornlea - BCS and pasture assessment - Spring calving and hybrid vigour Technical presentation - Update on MLA Project B.GPB.0038 - Hybrid vigour potential in the beef industry - Value of EBV's for fertility and dystocia - Animal health investigation case study - Worm control strategies	Elke Hocking (Facilitator) Tim Prance, Ash Hunt Host Wayne Pitchford, The University of Adelaide Sean McGrath
Attendance	*23 producers from 15 businesses attended. 3 researchers from Ad. Uni (2 early career post-docs), 1 early career Ag. Science graduate and 3 consultants were involved.*	*15,370 breeders.*
Session 7 August 2022 *Open to Public	Host: Dean Eastwood, Bool Lagoon - BCS and pasture assessment - use of eID to record liveweight data Technical presentation (open to public) - Fixed time AI (pros and cons) - Pregnancy scanning and foetal aging - Ultrasound scanning demonstration monitor mob - Profit drivers and target KPI's for self-replacing beef enterprises - Different calving time (pros and cons) interactive discussion	Elke Hocking (Facilitator) Tim Prance Host Sean McGrath Nathaniel Modra, Pinion Facilitated discussion
Attendance	*Attended by 40 people. 33 producers from 17 businesses (21 producers from 12 businesses within the PDS and an additional 12 producers from 5 businesses outside of the group). Additionally, 2 veterinarians, 4 consultants and 1 media person (Stock Journal) were involved.*	*21,405 breeders (13,395 no. head sold)*
Session 8 December 2022	Host: Ian Johnson, Beachport property - BCS and pasture assessment - Use of foetal aging within business Technical presentation - Update on MLA Project B.GPB.0038 - Herd rebuilding project - Maternal productivity decision support tool	Elke Hocking (Facilitator) Tim Prance Host Wayne Pitchford & Darren Koopman, The University of Adelaide
Attendance	*Attended by 22 people. 19 producers from 12 businesses within the PDS and 3 consultants were involved.*	*16,000 breeders*

Meeting date and Session #	Host farm and topics	Technical presenters
Session 9 April 2023	Host: Tom and Todd Woodard, Wrattonbully - BCS and pasture assessment - Maia Grazing - Low stress stock handling - Regenerative Ag - Heifer maternal productivity decision support tool host farm results and financial benchmarking KPI's for beef businesses - Optiweigh technology to monitor weaners - Nutritional requirements and pasture assessment refresher	Elke Hocking (Facilitator) Tim Prance, Sean McGrath Host Host / Elke Hocking Producer: Mark Bruce Ash Hunt and Tim Prance
Attendance	*Attended by 21 people. 17 Beef PDS producer participants (7 businesses), representing 10,000 breeders and 4 consultants.*	*10,000 breeders.*
September 2023	Naracoorte Showgrounds, Naracoorte Interactive workshop (closed session) - Partial budgeting workshop and how to use data effectively for decision making	 John Francis, Agrista
Attendance	*20 producers from the PDS project (12 businesses), 14 producers external to the group.*	*10,310 breeders from PDS group+ 4,767 breeders from the other producers in attendance.*
Session 10 December 2023	Host: Mark and Charlie Bruce, Keilira - Pasture assessment - Pasture renovation and grazing strategies - Planning session for next 3 years topics - Mental health resources - End of project BBQ	Elke Hocking (Facilitator) Tim Prance Host Elke Livestock SA – FaB mentor
Attendance	*Attended by 23 people. 17 producers (9 businesses) and 6 consultants.*	*8,480 breeders.*

Figure 16 – Beef PDS participants discuss the feed on offer at Mark and Charlie Bruce's, Keilira property at the final session of the project, before enjoying "36° South" rib-eye fillet steaks sourced locally from Teys Australia Naracoorte.

Mackillop farm management group (MFMG) livestock field days were open to the wider public and advertised through MFMG communication channels (social media, newsletters etc). Target: 3 field days (August 2021, August 2022 and September 2023).

Table 49 – Mackillop farm management group livestock field days (open to public)

Meeting date	Topics	Technical presenters
Session 3 & 7 open to the public.	See metrics in Table 48 above.	
MFMG livestock field day August 2021	**MFMG livestock field day, Lucindale Football Clubrooms, Lucindale.** *- "Optimising heifer development and management to increase whole herd productivity." MLA project B.GPB.0038.* *- MFMG Beef PDS: "Reproductive health and management practices for beef heifers."*	Wayne Pitchford, The University of Adelaide Elke Hocking
Attendance	*Of the 40 attendees to the MFMG Livestock Field Day, 3 producers were from the PDS project, and the remainder were external to the group (Including 7 consultants and 1 media representative).*	
MFMG livestock field day September 2023	**MFMG livestock field day "Beefing up your bottom line", Naracoorte showgrounds.** *- Market and consumer expectations for beef and TFI's vision for the future of beef processing, automation, and carcase feedback.* *- Profit drivers and key performance indicators for self-replacing beef cattle enterprises* *- How can beef producers remain profitable year in-year out, regardless of fluctuating beef prices?* *- Snapshot of key finding of Beef PDS "Reproductive health and management practices for beef heifers" and facilitated Q&A panel session with Beef PDS members.*	Mark Inglis, Thomas Foods International (TFI) John Francis, Agrista Elke Hocking, Elke Hocking Consulting (PDS group facilitator)
Attendance	*Of the 46 attendees to the MFMG Livestock Field Day, 20 producers were from the PDS project (12 businesses), 14 producers external to the group, 9 consultants, 2 NAB bank staff and 1 meat processor.*	*10,310 breeders from PDS group+ 4,767 breeders from the other producers in attendance.*

4.5.2 Content of sessions and extension material distributed to producers

Session 1, December 2020: Interactive hands-on skill development workshop, Host farm: Darryn Simon, "Woodrise," Beachport (Left the group in 2022 due to farm being sold).

- Host farm production practices and current management.
- Outline of measurements and protocols for data collection on monitor mob.
- ID potential topics for technical sessions throughout project (group).
- ID potential animal health issues (Sean McGrath, Millicent Veterinary Clinic).
- How to practically assess body condition scoring (James Pitchford representing The University of Adelaide Heifer development project).
- Pasture assessment skill development (Tim Prance, T. Prance Rural consulting).
  Extension materials distributed to producers:
  Agriculture Victoria factsheet: Condition scoring of beef cattle.
  https://agriculture.vic.gov.au/livestock-and-animals/beef/health-and-welfare/condition-scoring-of-beef-cattle#
- Figure 2: The digestibility of pasture species in a typical season at Hamilton (similar to South East region) Source: Greener Pastures for South West Victoria, 2006.
  http://www.lifetimewool.com.au/tools/pastures.aspx

Figure 17 – Beef PDS participants get hands-on body condition scoring practice in Session 1 at 'Woodrise', Beachport.

Session 2, March 2021: Interactive hands-on skill development workshop. 2 Host farms: Graeme and Tyson Smith, Rendelsham and Andrew and Sam Bell, Sebastapol.

Host farm management strategies: peer to peer facilitated discussion throughout the day with technical advice and information from Sean McGrath, Tim Prance, Elke Hocking.

- Calf Post-mortem demonstration (Sean McGrath - Millicent Veterinary Clinic).
- Calf Scours: prevention, diagnosis and treatment. Demonstration of stomach tubing a calf to treat scours (Sean McGrath - Millicent Veterinary Clinic).
- Body condition scoring and pasture assessment at both host farms.
- Discussion of current nutritional and feed requirements through calving and lactation.
- Discussion of animal health treatments for trace element and mineral deficiencies.
  Extension materials distributed to producers:
- MLA Tips and Tools, Animal Health and Welfare: Preventing calf scours in suckler beef enterprises and Treating calf scours.
  https://www.mla.com.au/research-and-development/animal-health-welfare-and-biosecurity/diseases/infectious/calf-scours/
- Write-up and photos of post-mortem demonstration (Appendix 7.1.2)

Session 3, May 2021: Technical session with industry and veterinary expert + Host farm visit. Host farm: Darcy and Chris Bateman, Furner.

Technical presenter: Andrew Whale, Livestock Logic.

- Metabolic diseases around calving and lactation.
- Management of cattle worms and use of worm egg counts.
- Drench resistance.
- Interaction between worms, nutrition and pregnancy status.

Technical presenter: Gary Glasson, Zooetis.

- how to minimise the impact of cattle reproductive and respiratory diseases on-farm.
- best-practice vaccination in cattle.

Host farm management strategies: peer to peer facilitated discussion throughout the day with technical advice and information from Sean McGrath, Andrew Whale, Tim Prance, Elke Hocking.

- Body condition scoring and pasture assessment.
- Selection of animals in low BCS had blood and faecal samples taken in the workshop by Sean McGrath (written up in Animal Health Case study).
  Extension materials distributed to producers:
- Powerpoint presentation on metabolic conditions and worm management.
- Table 1 and 2: Calendar for worm and fluke control in spring and autumn calving herds https://paraboss.com.au/annual-program/western-victoria-and-south-australia/
- Zooetis: https://www.zoetis.com.au/livestock-solutions/southern-beef/index.aspx

Mackillop Farm Management Group Livestock field day (August 2021)

Adelaide University R&D project speaker Wayne Pitchford on "*Optimising heifer development and management to increase whole herd productivity*." MLA project B.GPB.0038.

Elke Hocking spoke about the aims of the current project and where producers who are not part of the group will be able to find future results of this and other projects (ie MFMG member website, MLA websites) and promotion of where producers can find current extension material on the topic (MLA website – More Beef from Pastures, Tips and Tools etc).

Session 4, December 2021: Technical session with industry expert + Host farm visit + interactive hands-on skill development. Host farm: Michael Cobiac, Reedy Creek (Case study producer).

Technical presenter: Penny Schulz, Schulz Livestock**.**

- Genetics: Understanding EBV's workshop.
- "Bred-Well, Fed-Well" MLA content and interactive workshop for half a day.
- Producers worked in groups to refine their breeding objectives for their businesses.

Technical presenter: Sean McGrath, Millicent Veterinary Clinic**.**

- Nutrition to reach target 95% PTIC and 90% weaning rates.
- Reference weights and BCS targets for joining (60-65% mature reference weight).
- Understanding heifer energy requirements through gestation.
- Current Feedtest pasture results from within the group and whether they meet current requirements of heifers.

Host farm management strategies: focus on financial benchmarking within the business and transition from mixed livestock to 100% cattle enterprise and current breeding objective. This created discussion within the group around the economic impacts of different calving and management systems (stocking rate, fertility and condition score targets and sale weight implications).

- Bull structural soundness and fertility testing demonstration in the yards (scrotal circumference measurement, semen collection and visual assessment of sperm motility under microscope).
- Peer to peer facilitated discussion throughout the day with technical advice and information from Sean McGrath, Tim Prance and Elke Hocking.
- Body condition scoring and pasture assessment.

Extension materials distributed to producers:

- Powerpoint presentations on Bull Selection, Bull Soundness and fertility.

Figure 18 – Session 4, hosted by Michael Cobiac at Reedy Creek, was an interactive session with Sean McGrath, Millicent Veterinary Clinic, demonstrating bull structural soundness and fertility assessment (top and bottom left) including viewing sperm motility under the microscope (bottom right). Penny Schulz, Schulz Livestock, discussed genetics and bull selection (top right).

Session 5, March 2022: Technical session with industry expert + Host farm visit + interactive hands-on skill development. Host farm: James McKay, Lucindale.
Technical presenter: Ashlee Hunt, Tailored Livestock Consulting.

- Nutritional requirements of beef cattle.
- Producers calculated the nutritional requirements of their monitor mobs and how much energy was being supplied out of the paddock (or from supplementary feed).

Technical presenter: Sean McGrath, Millicent Veterinary Clinic.

- What to look for during calving-when to call the vet.

Host farm management strategies: rotational grazing management through the Triple P-paired paddock MLA program in the early 2000's and where it is at now. Calf scour prevention (experience with vaccination).

- Peer to peer facilitated discussion throughout the day with technical advice and information from Sean McGrath, Ashlee Hunt, Tim Prance and Elke Hocking.
- Body condition scoring and pasture assessment.
  Extension material distributed to producers:
- Powerpoint presentations: Calving management, animal nutrition requirements and feed budgeting workbook.

Figure 19 – Tim Prance, T. Prance Rural Consulting, discusses pasture availability in relation to cattle nutritional requirements at the March 2022 Beef PDS Session 5 workshop.

Session 6, May 2022: Technical session with industry expert + Host farm visit + interactive hands-on skill development. Host farm: Toby Hassell, Thornlea.

Technical presenter: Wayne Pitchford, The University of Adelaide.

- Update from the Adelaide University R&D project "*Optimising heifer development and management to increase whole herd productivity*." MLA project B.GPB.0038.
- Hybrid vigour potential in the beef industry.
- Value of EBV's for improving fertility and reducing dystocia.

Technical presenter: Sean McGrath, Millicent Veterinary Clinic.

- Animal health investigation results of producer monitor mobs.
- Refresher on worm control strategies.
- Host farm management strategies: spring calving system.
- Peer to peer facilitated discussion with technical advice and information from Wayne Pitchford, Sean McGrath, Ashlee Hunt, Tim Prance and Elke Hocking.
- Body condition scoring and pasture assessment.

Extension material distributed to producers:

- Powerpoint slides: Adelaide University Heifer development project and hybrid vigour.

Figure 20 – Beef PDS participants were able to practice body condition scoring at the May 2022 Session 6 workshop, hosted by Toby Hassell, Thornlea SA.

Session 7, August 2022: Technical session with industry expert + Host farm visit + interactive hands-on skill development. Host farm: Dean Eastwood, "South Killanoola", Bool Lagoon.

Technical presenter: Sean McGrath, Millicent Veterinary clinic.

- Fixed time AI: what's involved. Discussion with producer Dean Eastwood (South Killanoola) about pros and cons of using the technology.
- Pregnancy scanning and foetal aging – best time for diagnosis and benefits of foetal aging. Discussion from producer Ian Johnson using foetal aging.

Technical presenter: Nathaniel Modra, Pinion.

- Profit drivers and target KPI's for self-replacing beef cattle enterprises.

Host farm management strategies: use of eID technology, Fixed time AI and pregnancy scanning.

- Group facilitated discussion around the pros and cons of different calving times for the region. Producer experiences from within the group of different calving times in regard to nutrition, supplementary feeding, animal health, marketing, and profitability.
- Peer to peer facilitated discussion throughout the day with technical advice and information from Sean McGrath, Nathaniel Modra, Tim Prance and Elke Hocking.
- Body condition scoring and pasture assessment.
- Demonstration of ultrasound pregnancy scanning on monitor mob.

  Extension material distributed to producers:
- Powerpoint slides: Pregnancy testing, fixed time AI, beef profit drivers, Beef PDS results.
- Link to project page where powerpoint presentations from this session are located, along with short videos from the day: https://www.mackillopgroup.com.au/blog/reproductive-health-and-management-practices-for-beef-heifers/1577113

Session 8, December 2022: Technical session with industry experts + Host farm visit + interactive hands-on skill development. Host farm: Ian Johnson, "Amherst", Beachport (Case study producer).

Technical presenter: Wayne Pitchford and Darren Koopman, The University of Adelaide.

- Heifer development project - presentation of data from Sam and Andrew Bell (participating producers within the University R&D project as well as being involved in the Beef PDS group). Discussion with producer group on format for data presentation.
- Herd rebuilding project presentation.
- Maternal productivity decision support tool: different scenarios modelled.

Host farm management strategies: herd management across several properties, use of foetal ageing to select replacement heifers (pregnant in the first cycle), animal health program (Pestiviris animal investigation).

- Peer to peer facilitated discussion with technical advice and information from Sean McGrath, Wayne Pitchford, Darren Koopman, Tim Prance and Elke Hocking.
- Body condition scoring and pasture assessment.

  Extension material distributed to producers:
- Powerpoint presentations: Adelaide University Heifer development project, Herd rebuilding project, Adelaide University maternal productivity decision support tool.

Session 9, April 2023: Host farm visit + interactive hands-on skill development. Host farm: Tom Woodard and Alex Walter, "Peel Pastoral", Wrattonbully.

Elke Hocking presented a snapshot from financial benchmarking on key Beef enterprise financial and production KPI's.

Host farm management strategies: herd management, breeding objective, animal health program, reproductive results of monitor mob and data from maternal productivity calculator.

- Demonstration of how the host property uses Maia grazing.
- Demonstration of low-stress stock handling of monitor mob in yards.
- Body condition scoring demonstration (Sean McGrath-how to BCS video).
- Regenerative Ag practices: "set aside paddock" Feedtest results and pasture measurement, dung beetles, carbon and soils discussion.
- Peer to peer facilitated discussion throughout the day with technical advice and information from Sean McGrath, Ashlee Hunt, Tim Prance and Elke Hocking.

Mark Bruce (Beef PDS producer).

- Demonstration of how he uses Optiweigh technology to monitor liveweights of weaners as an indicator of worm burdens.

  Extension material distributed to producers:
- Maia grazing: https://www.maiagrazing.com/
- Optiweigh: https://www.optiweigh.com.au/
- MLA e-tools: https://etools.mla.com.au/hub/
  - Stocking rate calculator.
  - Feedbase planning and budgeting tool.

Figure 21 – Mark Bruce discussed how he uses Optiweigh technology in his beef enterprise at Session 9, hosted by Todd and Tom Woodard, Wrattonbully.

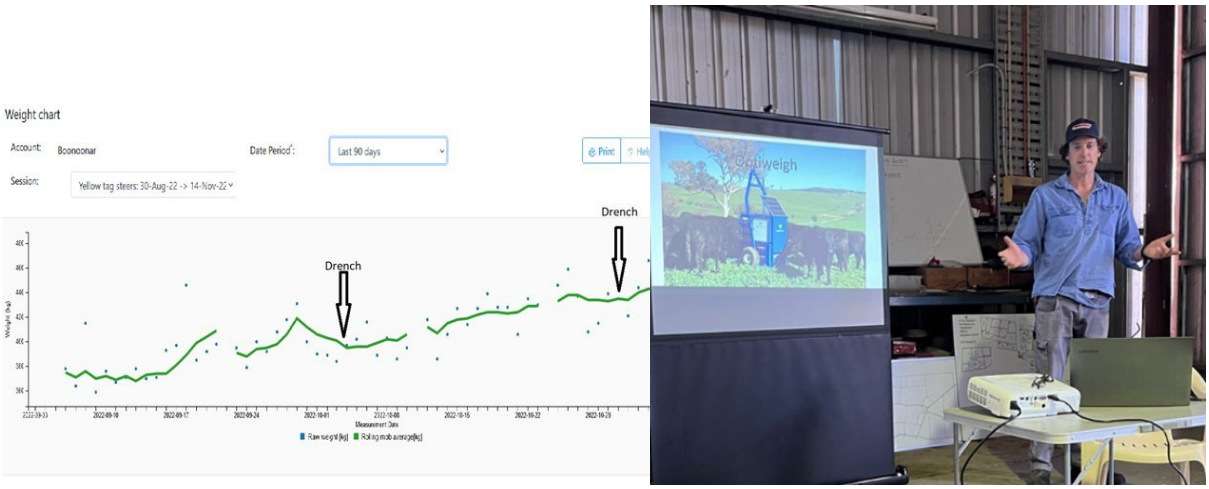


Figure 22 – Host for Session 9 Todd Woodard, Wrattonbully talks about low stress stock handling (top left), whilst his son Tom Woodard, Wrattonbully (bottom left), demonstrated the use of Maia grazing during his presentation. Ash Hunt, Tailored Livestock Consulting, led the pasture assessment of Woodard's 'set-aside paddock' (below right).

Session 10, December 2023: Host farm visit + interactive hands-on skill development. Host farm: Mark and Charlie Bruce, Keilira.

Host farm management strategies: herd management, animal health program, reproductive results of monitor mob, seasonal challenges, pasture renovation – successes and failures.

- Body condition scoring and pasture assessment.
- Peer to peer facilitated discussion with technical advice and information from Sean McGrath, Ashlee Hunt, Meg Bell, Tim Prance and Elke Hocking.
- Livestock SA "Red Meat Connects BBQ": mental health resources and FaB mentor.
  Extension material distributed to producers.
- https://ifarmwell.com.au/
- https://www.ruralbusinesssupport.org.au/
- https://www.pir.sa.gov.au/funding_and_support/fabm
- More Beef from pastures modules: https://mbfp.mla.com.au/
- Early weaning of beef calves: https://agriculture.vic.gov.au/livestock-and-animals/beef/health-and-welfare/early-weaning-of-beef-calves
- Beef cattle drought feeding guide: https://www.feedinglivestock.vic.gov.au/wp-content/uploads/2019/02/Beef-cattle-drought-feeding-guide.pdf
- Mac Troupe Oration from Grassland Society Conference Proceedings July 14th, 2022 – "Have we lost direction in the way we manage pastures?"

<u>September 2023: MFMG Livestock field day: 'Beefing up your bottom line"</u>
Mark Inglis, Thomas Foods International (TFI): Understanding the beef consumer.

- Market and consumer expectations for beef and TFI's vision for the future of beef processing, automation, and carcase feedback. (Podcast)

John Francis, Agrista: Beef enterprise profit drivers.

- Profit drivers and key performance indicators for self-replacing beef cattle enterprises.
- How can beef producers remain profitable year in-year out, regardless of fluctuating beef prices?

Elke Hocking: Snapshot of key findings for the PDS.

- Facilitated Q&A session with Beef PDS members about what they have learnt / adopted from being involved in the Beef PDS.

Interactive workshop closed session with two MFMG Beef PDS groups, John Francis, Agrista.

- Partial budgeting.
- Producers worked in groups to list what potential investments they had in their businesses (ie feeding to fill winter feed gap, pasture improvement/fodder crops, preventative animal health treatments…….)
- Aim: How to use data effectively for decision making and to encourage producers to know their cost of production.

Figure 23 – Elke Hocking, Beef PDS project manager, led the discussions throughout the three-year project. Elke is pictured here with the group at the May 2022 Session 6 Beef PDS workshop, hosted by Toby Hassell, Thornlea SA.

4.5.3 Project communications

Project page

MLA PDS project page: Reproductive health and management practices for beef heifers: https://www.mla.com.au/extension-training-and-tools/search-pds/pds-data/reproductive-health-and-management-practices-for-beef-heifers/

Mackillop Farm Management Group – Project Page: Reproductive health and management practices for beef heifers. Project page on the MFMG website (podcasts, newsletter, and presentation links): https://www.mackillopgroup.com.au/blog/reproductive-health-and-management-practices-for-beef-heifers/1577113

In depth articles (Target=3)

- MLA news: *Producers band together to boost productivity*, 16 February 2022 (Appendix, 7.1.3) https://www.mla.com.au/news-and-events/industry-news/producers-band-together-to-boost-productivity/
- Mackillop Farm Management Group Trial Booklet 2021 (*Reproductive health and management practices in beef heifers*. Appendix 7.1.4).
- As part of Tim Prance's consultancy role with producers within the group, one of his pasture investigations led to him writing a case study for the Grassland Society of Southern Australia Newsletter, Edition 345, December 2021. This information was presented to producers in Session #2. (*Mineral and Trace Element Spray Applications to Reduce Heifer and Calf Losses During Calving.* Appendix 7.1.5)
- MGMG spring newsletter article 2022/2023. (*Reproductive health and management practices in beef heifers.* Appendix 7.1.6).
- MLA Feedback Magazine article: 26 July 2023 (*Hot tips for top heifers*. Appendix, 7.1.7) https://www.mla.com.au/news-and-events/industry-news/hot-tips-for-top-heifers/
- MFMG Trial Booklet 2023 (*Collaboration key to improved heifer management and reproductive success*. Appendix 7.1.8).
- MFMG Trial Booklet 2023 (*Implementation of preventative animal health plan to increase reproductive success and reduce mortality rates in heifers*. Appendix 7.1.9).

Videos (Target=3x 5-minute project summary videos)

1-minute videos on pregnancy scanning and foetal aging, Artificial insemination, and beef profitability (content from guest speakers and producers at Session 7). MFMG You-Tube channel: https://www.youtube.com/@MacKillopGroup/featured

- Logistics of Artificial insemination,
- Pregnancy Testing and use of foetal aging,
- Value of being in an MLA PDS group,
- Producer - use of foetal aging.

Video footage captured at Session 9 (body condition scoring): use of pregnancy scanning and foetal aging (presented at September livestock field day). MFMG field day. Preg Scanning.mp4

Podcasts (Target=3)

The Prosperous Farmer Podcast: https://www.mackillopgroup.com.au/the-prosperous-farmer

- Season 1: Episode 2, 27th June 2022: Benchmarking beef with Michael Cobiac and Elke Hocking.
- Season 1: Episode 6, 25th July 2022: Driving farm productivity and profitability with John Francis.
- Season 2, Episode 2, 20th January 2023: Maximising beef production with Dean Eastwood and Sean McGrath.
- Season 4, Episode 2, 28th November 2023: The future of meat processing with Mark Inglis.

Presentations

Livestock Adviser Update presentation by Wayne Pitchford and Meg Bell on "*The role of advisors for driving research adoption*", Melbourne Livestock Advisor Updates: Thursday 8 September 2022.

Webinars

These were written into the project in case Covid restrictions prevented face to face meetings. They were not utilised, as the group valued the face-to-face interactions and being on host farms.

Social media (Target=9 social media posts)

- Evidence of social media posts can be found in Appendix 7.1.8.
- MFMG social media post: advertising Session 3 Animal Health workshop.
- MFMG social media post for Session #6 on the 25th of May 2022.
- MFMG social media post for Session #7 and also when the first podcast was released.
- Social media post advertising the collaborative presentation from The University of Adelaide and MFMG PDS projects at the Livestock Adviser Updates in Melbourne, September 2022.
- Social media post advertising the release of the Prosperous Farmer Podcast with Michael Cobiac and Elke Hocking, August 2022.
- Social media post following Session 7 August 2022: https://www.facebook.com/MacKillopGroup/posts/pfbid0256NA14C8MFvQQs3xzDKjs9noZcmSASU5hXBQ4Vyos3H8mG2gASv7ddsQHfSCyxgXl
- Social media post referencing the Beef PDS project and promoting a related project podcast March 2023. https://www.facebook.com/100057406631711/posts/pfbid0QVZ3HsJpuNByPWZ9Kcrz5mDBXNqJftQhvLo4UM8mFZJymeAgSeDepRUTLjcJYqiGl/?d=n
- Social media post following Session 9 May 2023: https://www.facebook.com/100071625274374/posts/pfbid0FRvaRC8SpTJqUATF6Bp4XRieCzGmHHERQaZNYxzCK1DbggskCSZ9UT5evsQffjgEl/?d=n
- Social media post MFMG "Beefing up your bottom line."
    - Advertising the event x3.
    - John Francis presenting at the event x1.
    - Mark Inglis presenting at the event x1.
    - Group photo of event x1.
- Social media Facebook and Twitter post following final Session 10 December 2023.

4.6 Monitoring and evaluation

4.6.1 Knowledge, Attitude, Skills, Aspiration (KASA) analysis

32 producers, representing 19 participating beef businesses, with 18,600 breeding cows within the Limestone Coast region. This group met in person a total of 12 times over the course of the project and visited 11 host properties from within the group.

Over the course of the project, an additional 90 people have been engaged in the project through attendance at wider engagement events of the Mackillop Farm Management Group livestock field days. Of these extras, 46 have been producers and the remaining 14 have been either Livestock advisers, Veterinarians or Researchers.

- Pre-KASA surveys were returned by 24 produces from 19 businesses.
- Post-KASA surveys returned by 19 producers from 13 businesses.
- 91% overall satisfaction with the content of the project.
- 86% was the value of the project reported by producers in assisting them in managing their beef enterprises.
- The PDS project increased participants knowledge of the reproductive health and management practices for beef cattle by 78%.
- The PDS project increased participants skills in managing their beef cattle for health and reproduction by 78%.
- Overall change in knowledge increased by 19% from 66% to 85%.
- Overall change in skill & confidence increased by 13% from 65% to 78%.
    - Confidence in assessing BCS increased by 22% from 61% to 83%.
    - Confidence managing herd according to nutritional requirements increased by 14% from 65% to 79%.
    - Confidence assessing pasture quality and quantity increased by 17% from 65% to 82%.
    - Confidence managing reproductive and metabolic diseases increased by 16% from 63% to 79%.
    - Confidence managing parasites increased by 22% from 65% to 87%.
    - Confidence using BREEDPLAN EBV's to select bulls increased by 11% from 71% to 82%.
- It was pleasing to see that 100% of participants said they would record herd performance annually, pregnancy scan and have a breeding objective and use EBV's when selecting bulls. Table 50 shows KASA results for adoption of practices.

<u>Calculation of Beef COP and kg meat per hectare.</u>

Only 27% of the group calculated their Beef COP and kg meat per ha at the start of the project. Post KASA survey results showed that 84% of the group are already doing, have adopted or intend to undertake some form of financial analysis and calculation of meat produced per hectare of their beef enterprise. There have been a couple of members interested in doing full financial benchmarking in the future.

5% said that they wouldn't adopt the practice of financial measurement of COP and calculation of kg meat per hectare as they were an overseer rather than the business owner, however the manager has adopted this practice. The other 11% listed ignorance as the reason they wouldn't adopt.

Table 50 – Pre-project and post-project practices from producer group members

Pre-project practices (Y=normal, S=sometimes, R=rarely, N=never) Post-project practices (AP=Adopted previously, Y=Implemented, I=Intend to implement, N=Not implemented	*Pre-KASA	*Post-KASA	Practice adopted (AP, Y, I)
Calculate production efficiency of your herd (kg meat produced/ha).	Y=27% S=18% R=18% N=36%	AP=32% Y=26% I=26% N=16%	84%
Calculate Beef cost of production ($/kg liveweight).	Y=27% S=14% R=27% N=32%	AP=26% Y=26% I=32% N=16%	84%
Record pasture quantity (kg/ha) and quality throughout the year.	Y=18% S=36% R=9% N=36%	AP=48% Y=16% I=10% N=26%	74%
Record herd performance data annually (number of calves weaned to cows joined).	Y=68% S=14% R=9% N=9%	AP=42% Y=53% I=5% N=0%	100%
Keep individual records on reproductive performance.	Y=41% S=9% R=27% N=23%	AP=26% Y=27% I=0% N=47%	53%
Record mortality rates and cause of death in the herd.	Y=50% S=23% R=18% N=9%	AP=16% Y=68% I=0% N=16%	84%
Have a documented yearly animal health plan for your herd.	Y=41% S=32% R=9% N=18%	AP=16% Y=53% I=0% N=31%	69%
Assess body condition score (BCS) at key points in the reproductive cycle.	Y=18% S=36% R=9% N=36%	AP=0% Y=84% I=0% N=16%	84%
Pregnancy scan.	Y=27% S=18% R=18% N=36%	AP=47% Y=53% I=0% N=0%	100%
Record foetal age when pregnancy scanning.	Y=27% S=14% R=27% N=32%	AP=0% Y=47% I=21% N=32%	68%
Have a breeding objective and use EBV's when selecting bulls.	Y=82% S=14% R=0% N=5%	AP=47% Y=53% I=0% N=0%	100%
Manage the herd for a 6-9 week joining.	Y=95% S=0% R=5% N=0%	AP=42% Y=47% I=0% N=11%	89%

** 24 pre-KASA survey forms returned (19 businesses), 19 post-KASA survey forms returned (14 businesses)*

Record pasture quantity and quality throughout the year

- 74% of participants have already adopted, adopted, or intend to adopt the practice of recording pasture quantity and quality throughout the year.
- Of those who listed they wouldn't adopt this practice:
    - 11% said they used practical experience rather than measurement,
    - 5% said they had limited time,
    - 5% said they just graze it and,
    - 5% used a pasture monitor app instead.

Keep individual records on reproductive performance

- Only 53% of participants have already adopted, adopted, or intend to adopt the practice of keeping individual records on reproductive performance.
- Of those who said they wouldn't adopt this practice:
    - 10.5% said that all animals are pregnancy tested and managed as a mob. Each cow must get pregnant and raise a calf otherwise they will get culled.
    - 36.5% said it was too time consuming and that it was either not a significant issue on their property, they couldn't see a benefit or were unsure whether it was worthwhile.

Record mortality rates and cause of death in the herd

- Of the 16% who listed they wouldn't adopt this practice:
    - 5% weren't the owner (and the owner listed they would adopt the practice),
    - 11% said they tried to keep it as low as possible.

Have a documented yearly animal health plan for the herd

- Of the 31% who said they didn't have a documented yearly animal health plan:
    - 21% said animal health wasn't an issue due to their grazing practices and that animal health wasn't a problem on their property.
    - 10% said that they had a plan, they just didn't have it written down.

Assess body condition score at key points in the reproductive cycle

- Only 16% said they wouldn't adopt this practice due to saying that they could assess it visually in the paddock.

Record foetal age when pregnancy scanning

- The 32% who said they wouldn't adopt this practice commented that it wasn't a significant issue on their property.

Manage the herd for a 6-9 week joining

- The 11% who had longer joining times stated they managed this by selling late calvers as a cow and calf unit after calving.

Post-KASA written comments and feedback from participants

What practices have had biggest impact on your beef enterprise and why?

Measurement, monitoring and managing

- Monitoring BCS of females during the reproduction cycle to help improve conception rates and rejoin rates.
- Pro-actively managing weaner heifers to achieve critical mating weight prior to joining.
- Regular individual weight records to monitor weight gain of weaners.
- Pasture renovation in conjunction with paddock sub-division to improve pasture utilisation and quality, which leads to increased kg beef produced /ha.
- Weaning management.
- Using dogs instead of people and vehicles.
- Never keep a cow that drops a dead calf.
- Never give a heifer a second chance to get in calf.
- Better track our kg/produced. Feeding first calving cows better.
- Farmbot water monitors.
- Better understanding of EBV's for joining heifers
- All of what has been spoken of throughout the three-year project.

Animal health

- Developed a whole of herd and whole of lifetime animal health program - have had excellent results so far.
- Information on animal health.
- More strategic health treatments.
- Improved parasite control in weaners.
- Diagnosing mineral deficiencies in herd (iodine).
- Trace element testing of cow livers to ascertain our deficiencies and then supplement to maximise /improve growth and reproduction.
- Supplementary feeding at calving to help with magnesium and calving issues.

Joining length, calving time, and foetal aging

- Still planning on changing to spring calving.
- Spring calving, but not without difficulties - allows a higher winter stocking rate.
- Looking to change the time of calving.
- Change to spring calving.
- Changing time of calving to better suit the feed availability.
- Confidence to implement a short joining period in heifers (five weeks).
- Six-week joining on heifers.
- Six-week joining - tighter herd, less weight range. More fertile animals.
- Joining 90% of all heifers and foetal aging. Retaining early conception heifers (four-week spread). Marketing the balance (calving four to five-week period). Average age of the herd is significantly lower now. Not re-joining oldest age group. Saving bulls, wean early sell cows ASAP.
- Foetal aging to make informed business decisions e.g. selling, stock movements.
- Foetal aging heifers before calving.

What have you enjoyed most and why?

- Connect with other beef producers over a long period (three years).
- The relevant information provided amongst like-minded farmers.
- Interaction between members of the group - excellent facilitation.
- Interaction between members of the group, seeing how other farmers operate.
- Interacting with other like-minded producers. The special guests used and presenters.
- Group dynamics and the networking opportunities. Having access to the experts and presenters. Learning about other producers' production systems, farm visits.
- Networking and speakers.
- Networking.
- Networking and peer to peer learning.
- Discussion with other producers.
- The sharing of data with the other participants.
- Seeing other participants properties.
- Group interaction and guest speakers.
- Group discussions on local topics and issues.
- Everyone's input.
- Open discussions involving participant enterprises.
- Listening to some of the invited speakers.
- Involved with other producers and scientists on farm tours.
- Variety of speakers.

Figure 24 – Beef PDS participants enjoyed the interactive practical demonstrations throughout the three-year project. Below left – Beef PDS participants watch fertility testing at Michael Cobiac's, Reedy Creek yards during Session 4. Below right: Tim Prance measuring feed on offer at Toby Hassell's Thornlea property during Session 6.

4.6.2 Evaluations from Technical sessions

Animal health workshop (Session 3-May 2021)

- Attendance: 17 producers from 12 businesses, representing 10,880 breeders, attended the farm tour prior to technical session. 21 producers from 14 businesses attended the technical session, plus 8 other people (not within group).
- 25 evaluation surveys were returned.
- Out of a possible score of 10, the workshop was rated 9.2 for overall satisfaction and 9.0 for value to their businesses.
- Guest speakers rated 9.5 for Andrew Whale and 7.9 for Gary Glasson.
- Surveys indicated that 100% of attendees would recommend the workshop to others, 68% would make changes. Of the 32% not intending to make changes, 16% were already doing and 16% were non-producers.

<u>Feedback from Animal health technical session</u>

- Andrew Whale's knowledge and clear explanations.
- Delivery was well-presented and easy to follow - very focussed on problems seen commonly by producers in the SE.
- Realistic approaches to worm control were very clear and easy to follow.
- The drench usage, resistance, and drench timing information. Also, pesti-virus explanation.
- Strategic drenching and worm discussion.
- New information on drenches.
- Information on checking WEC in young cattle and recommendations to do drench efficacy tests.
- Drench efficacy and timing, information about vaccines.
- Very valuable - we will be changing our drenching program.
- Discussion around cattle that are down and how to treat (metabolic).
- Drench information and Grass Tetany strategies.
- Really good information on reproduction and respiratory disease slideshows - this is where I had the least knowledge.
- Presentations and interaction, including the discussions post presentation (speakers stayed for BBQ dinner).
- All the topics were very relevant, and we will be making changes.
- Group interaction with other producers.
- Learning about little facts that I didn't already know.
- Overall, a great day, good speakers, and interaction with group members.
- Good information - helpful revision.
- Reinforced personal theories with trial data and professional expertise.
- Very valuable as it was focussed on reproductive rates and weight gain issues.
- Good to hear what other producers are doing regarding preventative medicine (Vet student).
- Discussion and relating back to individual producers (Vet student).
- Have a really good understanding of problems producers are facing in the SE (veterinary student).

MFMG Livestock Field Day (August 2021)

- Of the 40 attendees to the MFMG Livestock Field Day, 3 producers were from the PDS project, and the remainder were external to the group (Including 7 consultants and 1 media representative).
- Evaluations for Dr. Wayne Pitchford returned a result of 4.7 where a score of 5 was excellent.

Technical Beef Genetics/Bull Fertility workshop (Session 4-December 2021)

- 20 producers from 15 businesses, representing 9,030 breeders, attended. 3 early career professional consultants and 4 consultants were involved.
- 21 evaluation surveys were returned.
- Out of a possible score of 10, the workshop was rated 8.9 for overall satisfaction and 9.0 for value to their business.
- Guest speakers were rated 9.1 for Penny Schulz and 9.0 for Sean McGrath.
- The interactive session on bull fertility testing/Pasture assessment and BCS was rated at 8.5.
- 100% of attendees would recommend the workshop to others, 56% would make changes to their businesses. Those who answered no to making changes were either not producers or were already doing it.

<u>Feedback from Animal genetics workshop: What did you like most and why?</u>

- Genetic information and visuals of bull health and CS.
- Genetics and EBV session.
- Exploring EBV's and BREEDPLAN.
- EBV selection.
- Explanation of EBV's.
- Refreshing on EBV's and where to compare studs (online tools).
- All good. Penny's data driven information.
- Got some ideas to suggest to the team.
- Hearing about host farm operation (Michael Cobiac).
- Host comments.
- Host session on his business.
- Practical and theoretical sessions good.
- Good quality speakers / relevant topics.
- Open, honest discussion and information.
- Hearing a range of views.
- Enjoyed the whole day.

Nutritional requirements of breeding cattle and calving issues (Session 5-March 2022)

- 24 producers from 15 businesses, representing 13,670 breeders, attended. Additionally, 3 consultants were involved.
- 22 evaluations were collected verbally at the end of this session.
- Out of a possible score of 10, this workshop was rated 8.5 for overall satisfaction for content and 8.3 for value to their business.

Wayne Pitchford "*Optimising heifer development and management to increase whole herd productivity*" (MLA project B.GPB.0038), hybrid vigour and Sean McGrath animal health case study presentation (Session 6, May 2022)

- 23 producers from 15 businesses, representing 15,370 breeders, attended. 3 researchers from Ad. Uni (2 early career post-docs), 1 early career Ag. Science graduate and 3 consultants were involved.
- 17 evaluation surveys were returned.
- Out of a possible score of 10, the workshop was rated 8.5 for overall satisfaction and 8.3 for value to their business.
- Guest speakers were rated 8.4 for Sean McGrath and 9.2 for Wayne Pitchford.
- 29% would make changes to their businesses. 59% were not sure if they would make changes (already doing), with 12% not sure as this was their first session they had attended (new employees within the business)

What did you like most and why?

- Wayne's presentation (x 3)
- Needed to hear more from Wayne. All good. Liked Toby's presentation (host).
- Cross breeding and beneficial impact on our business.
- Learning about hybrid vigour and genetic potential was very interesting and the discussions were captivating.
- Longevity of bulls and understanding hybrid vigour. Just a different take on breeding cows.
- Very good discussion on hybrid vigour - could have been longer.
- Reinforcement of hybrid vigour and crossbreeding system.
- Excellent discussion on role of crossbreeding/heterosis in beef herd. Separating breed effect from heterosis effect was very informative.
- Highlighting good worm control, particularly strategic summer drenching to reduce overall burden. Also, older cows shedding lower worm eggs was useful information.
- Worm testing information was informative.
- Very interesting and informative discussion.
- Interaction with other producers.
- Exchanging ideas with like-minded people.
- Good information and common issues amongst producers.

Technical reproductive technologies and beef profitability Mackillop Farm Management Group Livestock field day (Session 7-August 2022)

- Attended by 40 people. 33 producers from 17 businesses (21 producers from 12 businesses within the PDS and an additional 12 producers from 5 businesses outside of the group) plus 2 veterinarians, 4 consultants and 1 media person (Stock Journal).
- A total of 21,405 breeders were represented by producers (13,395 head sold annually).
- 30 evaluation surveys were returned.
- Out of a possible score of 10, the workshop was rated 8.8 for overall satisfaction and 8.5 for value to their business.
- Guest speakers were rated 8.9 for Elke Hocking and Dean Eastwood (Beef PDS results and facilitated discussion).

- 8.4 for Nathaniel Modra (Beef profitability).
- 8.7 for Sean McGrath (Pregnancy scanning and foetal aging and Artificial Insemination.
- 48% of the audience planned to make changes because of attending the workshop, with 19% not sure or already doing and 33% said they wouldn't make any changes as they were employees or non-producers.

Mackillop Farm Management Group Livestock Field Day "Beefing Up your Bottom Line" (September 2023)

- Of the 46 attendees to the MFMG Livestock Field Day, 20 producers were from the PDS project (12 businesses representing 10,310 breeders), 14 producers external to the group representing 4,767 breeders, 9 consultants, 2 NAB bank staff and 1 meat processor.
- 30 evaluation surveys were returned.
- Out of a possible score of 5, the workshop was rated 4.3 for overall value,
- 3.9 for Mark Inglis's presentation,
- 4.4 for John Francis's presentation and
- 3.6 for the Q&A panel session with producers.
- 100% agreed or strongly agreed that the content of the activity was relevant in helping to manage their beef enterprise and 93% of participants agreeing or strongly agreeing that they were likely to make a practice change as a result of attending.

<u>What are some of the practice changes you are considering making as a result of this activity?</u>

- Will use information in whole farm system discussions.
- Create a plan.
- Mating all heifers and keeping 1st cycle.
- Condense heifer calving.
- Splitting heifers more at pregnancy testing.
- Re-evaluating feed demand.
- Spring calving.
- Contemplate time of calving.
- Time of calving.
- Working on a clear strategy with productivity and cost of production targets.
- More attention to detail on Snapshot (financial benchmarking) data.
- Undertake analysis of production per ha etc.
- Lowering my cost of beef production.
- We are planning on looking at kg of beef produced per ha and a more in-depth enterprise analysis.
- Implementing data recording and utilisation.
- Collect more data that I can measure and manage.
- More use of data already collecting.
- Do the financial calculations again, more regularly.
- I would consider using more production calculators to improve my business.
- Monitor production performance and costs more closely as margins tighten.

September afternoon interactive workshop with John Francis (September 2023)

- 18 evaluation surveys were returned.
- Out of a possible score of 5, participants gave a rating of 4.2 for the overall value of the workshop.
- 95% agreed or strongly agreed that they would make changes as a result of attending.

What are some of the practice changes you are considering making as a result of this activity?

- Critically analysing more $'s spent on different projects and the return on investment (ROI).
- Consider costs associated with improvements.
- Better financial analysis of options for improvements
- Should do more formal pricing for projects.
- Make better decisions regarding investments.
- More partial budgets on spending.
- Partial budgets.
- Spend more time on financial management i.e: cost of production etc.
- Evaluate cost of production.
- More pasture improvements.
- Replacement of infrastructure, i.e: water trough analogy.
- More exclusion fencing.
- Kangaroo exclusion fence.
- Tighter heifer joining.

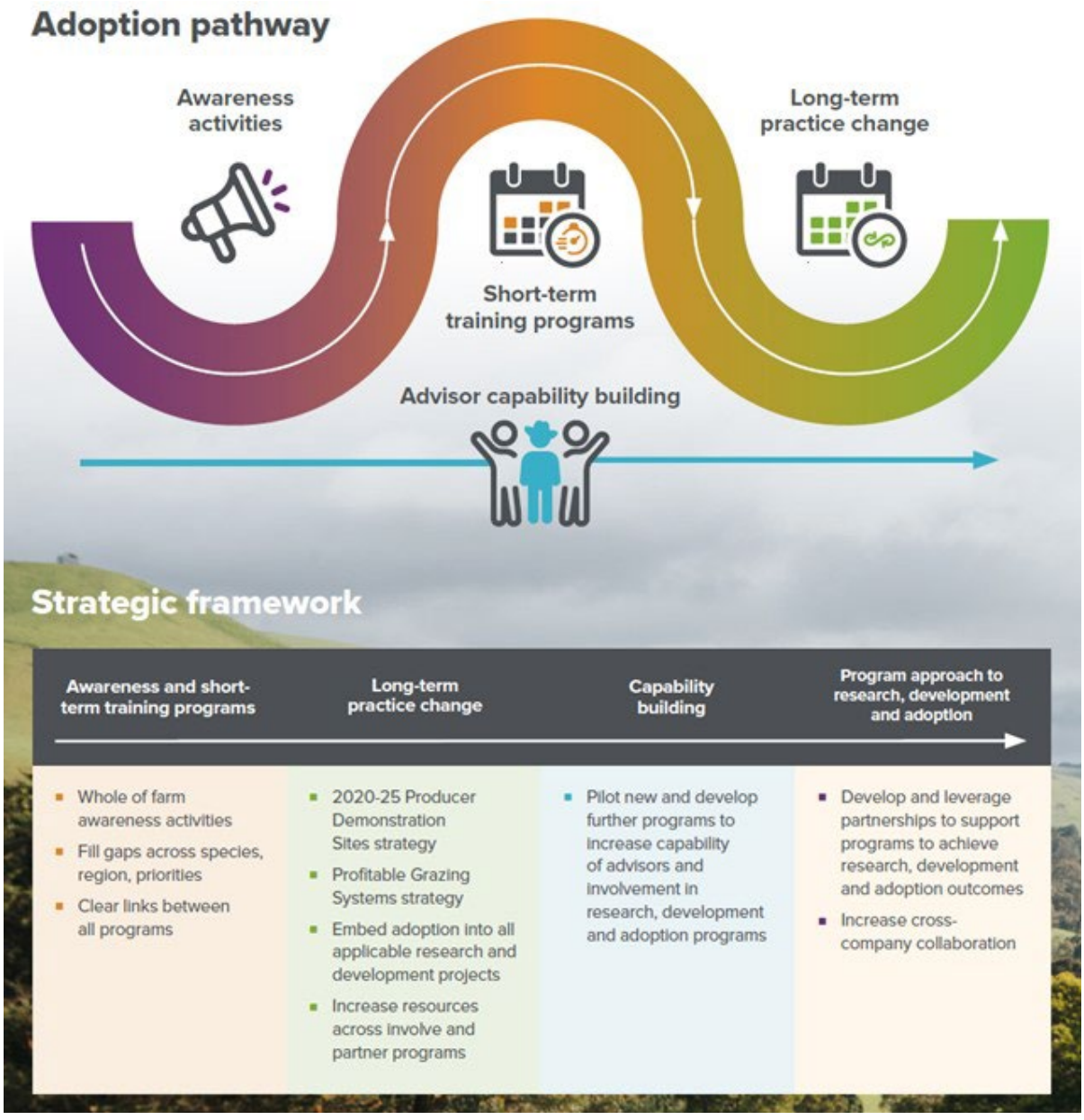
List three things you have learnt that are important to your business

- Partial budgeting. Investment analysis. Benchmark cost of production.
- Look at what will give you the best return not what you think will.
- Know your COP and kg beef/ ha.
- Budget. Question choices. Spend where required.
- Ideas need to financially fact checked to see if they stack up. Spending more in some areas can lead to better returns. Need to think deeply about all costs involved in a project.
- Production gains, partial budgets, TFI projects.
- Data Analysis, Looking outside the square.
- Rank ideas in order of cost effectiveness. Budget rather than gut feel. Factoring of Opportunity costs.
- Improve worst pastures gives highest return on investment. Spring calving matches nutrition. A good smoko makes everyone happy.
- Partial budgets. Importance of analysing cost of production etc.
- Spend more time in the office. Lift stocking rate.
- Leasing can appear profitable. Choosing capital improvements not straight forward. Exclusion fences are expensive.

5 Conclusion

This project was unique as it sits within the long-term practice change, capability building and program approach to research development and adoption (see Figure 25). Whilst it sat under the 2020-2025 Producer demonstration site model, it has also utilised the supported learning approach of the Profitable Grazing Systems strategy with repeated skill development throughout the program including body condition scoring and pasture assessment (similar to Lifetime Ewe management, but for heifer management). Additionally, early career consultants were brought into the program to help develop their capacity within the beef sector – one early on in the program participated in the MLA Livestock Intern program, and the other was a recipient of the 2022 bursary to attend the 2022 MLA Southern Livestock Adviser Update.

Figure 25 – MLA Adoption pathway



In an effort to increase cross-company collaboration, the project was also linked to an MLA funded Adelaide University R&D project B.GPB.0038, '*Optimising heifer development and management to increase whole herd productivity*', as well as having a local veterinarian, a private nutrition consultant and a private pasture agronomist attending nearly every session. This was a successful model for extending research information to producers, upskilling livestock advisers and providing both group and one-on-one support to producers for skill development and adoption of new practices. The facilitated peer-to-peer learning alongside industry technical experts and research outputs, ensured that any adoption of new practices was challenged and targeted towards creating actual improvements in productivity and profitability of individual beef enterprises.

Since every session was conducted at a host farm where producers were able to practice body condition scoring and pasture assessment, producers were able to continually improve their skills in these areas throughout the project, as evidenced by an improvement in confidence of 22% and 17% respectively. When doing the pasture assessments at each property, producers had to continually calculate the animal nutrition requirements of their animals at that time, in relation to their monitor mob's pregnancy status and the current pasture quality and feed on offer. As a result, producers became more familiar with the energy requirements of their livestock, or at least know where to find information (or consultants) to assist them with their calculations. Confidence in managing the herd according to their nutritional requirements increased by 14%.

A critical success factor of the project was that every session had a veterinary consultant, a pasture agronomist, a livestock nutritionist, and a livestock consultant in attendance, ensuring a continual feed of up-to-date technical, research and animal health information to producers within the group. Consultants involved throughout the project included Elke Hocking Consulting, T. Prance Rural Consulting, Sean McGrath – veterinarian and consultant Millicent Veterinary clinic, Ashlee Carslake-Hunt (Tailored Livestock Consulting) along with guest presenters Andrew Whale (Livestock Logic) and Penny Schulz (Schulz Livestock).

As a result of this exposure to private livestock consultants and researchers throughout the project, a number of participants realised that sometimes they didn't need to know everything themselves, but that they could draw on the extensive knowledge within the industry and pay for individual advice. Many producers have engaged Sean McGrath (veterinarian) to develop yearly animal health programs for their livestock enterprises as they recognized his expertise and the complexity of some of the metabolic and animal health issues. Other producers within the group are using Tim Prance for soil and pasture advice out of session, as well as Ashlee Carslake-Hunt for nutritional advice.

Peer-to-peer discussions and the ability to connect with other like-minded beef producers at each session has allowed a continuous knowledge transfer of regional management strategies between beef producers within the group. Throughout the project, group members were comfortable to share the good, the bad and the ugly in relation to their beef enterprises, creating an abundance of learning opportunities. This was the most frequently reported highlight in the feedback for each session and something the group valued.

The success of these peer-to-peer discussions was largely due to the careful preparation of session plans which were designed specifically to create a safe environment where producers were comfortable to share their experiences and knowledge. This was done through allowing ample time in the program to conduct 'around the room' updates on participants monitor mobs progress and an opportunity to share any seasonal or animal health issues that had arisen since the previous session. Each producer was given 10 to 15 minutes to give an update/express concerns. As well as the value to participants, these sessions were equally informative to the researchers and consultants involved in the project as it helped to inform them of any current industry issues producers were facing, and where priorities should be directed towards research and extension.

With this group (including consultants) deciding at their final session to continue for a further 2.5 years as a beef discussion group, they will continue to provide valuable insights to industry researchers and consultants and be connected into future beef RD&A projects.

The practices that were said to have had the biggest impact on improving heifer conception and rejoin rates have been:

- proactively managing weaner heifers to achieve critical mating weight targets and condition scores prior to joining (60% of SRW prior to heifer joining and 85-90% of SRW prior to second joining),
- monitoring body condition score throughout the reproductive cycle,
- understanding nutritional requirements at different stages of the reproductive cycle,
- supplementary feeding to meet nutritional requirements if there is a deficit,
- never keeping a heifer that fails to get pregnant or a cow that fails to rear a calf,
- fertility testing bulls prior to joining,
- selecting bulls based on the "days to calving" (DTC) EBV,
- foetal aging to identify and preferentially retaining heifers conceiving in the first cycle,
- developing a whole of herd and whole of lifetime animal health program.

Out of the core producer group who submitted mob-based data, seven businesses were autumn calvers, three winter calvers and three spring calvers. Whilst the different calving times made collection and analysis of data problematic, it was this diversity that drove robust discussions within the group and allowed participants to hear real world examples at the same time as receiving technical and research information. It was also evident to the consultants and researchers, that there needs to be specific extension messaging targeted towards the different calving systems.

For example, generally, the higher the body weight, the higher the reproduction rate. However, within different calving systems, some pasture and liveweight targets are more critical than others. For a late spring joining with a winter calving, liveweight at the start of joining is not as critical due to high growth rates from the increased flush of high-quality spring feed available. However, liveweight becomes more critical for autumn calving systems with a May/June joining as there's usually lower pasture availability and low growth rates of livestock during winter months.

With several producers within the group contemplating changing from an autumn to a winter or early spring calving system, the group discussions around calving time were valuable in determining what considerations producers need to think about before making major changes. The following is a summary of the considerations discussed:

- There may be a requirement to change target market of sale stock (i.e. feedlot entry rather than weaners or finished yearling cattle).
- Cash flow could be a problem. If you traditionally sell weaners in December or January, you may not get an income until after the next spring. Solutions to this could involve:
    - Trading to fill the gap in cash flow.
    - Selling out your calving autumn cows and buying in spring calving cows.
    - Keeping the weaners and selling after the first spring (rather than selling as weaners).
- The cost of feed (cents per kg dry matter) may not change, but less volume may be able to be fed to weaners compared to cows.
- High quality protein production feed will be needed to supplement younger weaners over the autumn period.

- Changing to a winter or spring calving system is only beneficial if you increase your stocking rate and pasture utilisation (and hence profitability).
- Consider the soil type and conditions through calving (potential for calves to be born in wet, muddy conditions in September in some areas) and the effect of potential pugging issues on the pasture.
- If in a shorter growing season area, September calving could also be too late, particularly if the season finishes early.
- Consider potential clashes with other operations in the management calendar.
- Consider the timing of calving and lactation in relation to animal health conditions such as metabolic conditions (i.e. grass tetany) and worm management.
- Have a good handle on your current reproductive, production and financial performance before making dramatic changes and plan out both the management and financial impact to the business.

5.1 Key findings

- Collaborative projects enable a supportive environment for on-farm adoption to occur.
- Measuring and monitoring the impact of liveweight, BCS, animal health, calving time and management on reproductive performance is beneficial for future management decisions.
- Knowing the mature reference weight of your breeding cows is important to set target joining weights for heifers and second calving cows.
- Reference weights are best taken two weeks after weaning and at BCS 3.
- Pros and cons of autumn vs spring calving systems should be explored thoroughly before changing the time of calving.

Of the 12 producers who submitted mob-based data, participants achieved the following:

- An increase in the percentage of joined heifers achieving 'WAPE' (defined as a heifer successfully getting in calf and getting back in calf within the first six weeks of joining). Only 48-57% of joined heifers within the baseline data had achieved WAPE, compared to 62% in the monitor mob, with further increases likely in subsequent heifer drops.
- Heifer conception rates of 2020 drop heifers remained similar to baseline levels (81% compared to 80% in 2019 drop heifers), however, an increase in heifer conception rates was seen in 2021 drop heifers to 84%. There was also a reduction in heifer mortality from 2.7% to 0.6%, as well as a reduction from 13% to 4% of heifers needing assistance at calving.
- Increase in re-conception rates of 2020 drop animals as second calvers from 88% (baseline) to 92%.
- Cow mortality in second calving cows reduced slightly from 0.2% to 0%.
- Measurement of the standard reference weight (SRW) of their mature cows within their herd (measured two weeks after the mature cow has weaned her calf at BCS 3.0) to set realistic targets for joining weights. Also understanding that each BCS is worth around 70-100kg in liveweight (depending on breed).
- The liveweights of heifers at joining increased from 52% SRW (baseline data) to 58% SRW.

Participants within the project increased their knowledge by 19% (from 66% to 85%) and increased their skills and confidence by 13% (from 65% to 78%).

100% of producers have adopted or intend to adopt the practice of:

- recording their herd performance data annually (number of calves weaned to cows joined).
- pregnancy scanning.
- have a breeding objective and use EBV's when selecting bulls.

89% of producers have adopted or intend to adopt the practice of managing their herd for a six to nine week joining.

84% of producers have adopted or intend to adopt the practice of:

- calculating their production efficiency of their herd (kg meat produced per hectare).
- calculating their beef cost of production ($/kg liveweight).
- recording mortality rates and cause of death in the herd.
- assess body condition score (BCS) at key points in the reproductive cycle.

74% of producers have adopted or intend to adopt the practice of recording pasture quantity and quality throughout the year.

69% of producers have adopted or intend to adopt the practice of having a documented yearly animal health plan for their herd.

68% of producers have adopted or intend to adopt the practice of foetal aging.

Only 53% of producers have adopted or intend to adopt the practice of keeping individual records on reproductive performance as they are not convinced that the extra time will translate into extra profitability. Most producers can easily identify individual poor performing animals, with culling based on the failure of heifers and cows to successfully get pregnant or rear a calf.

5.2 Benefits to industry

This project has already contributed significantly to the development of another beef producer extension project with an application submitted to MLA on "*Profitable and resilient Southern Beef Herds (MBfP 2.0)*." The group, developed within this project, will continue as a dedicated beef discussion group for a further three years and will provide a platform for R&D producer consultation and extension, as well as enabling mentoring opportunities for early career livestock consultants. The network of livestock consultants, veterinarians and beef producers within this project will continue to share with industry the valuable insights and lessons learned from this successful extension and adoption project.

Sean McGrath has also run a number of '*Heifers for Profit*' producer workshops in the region (coordinated by RIST), as a result of promotions and communications from this project (including word of mouth referrals from within the project participants to other producers).

The impact of adoption from this project is significant with 18,550 breeding cows within SA represented within the project. Several producers have expanded their land holdings and breeding numbers since the project commenced. This meant they had a requirement to build the numbers of livestock within their business and one of the ways they were trying to do this was through increasing heifer reproductive rates. The scenario modelling (from the '*Herd Inventory Management*

Strategies' project funded by the Future Drought Fund) presented by Darren Koopman, was informative in showing the most profitable strategies for building your herd is to join and retain more heifers or purchase young cows (in the current economic environment).

Recommendations

- Compared to sheep enterprises, beef adoption projects need sufficient time to see changes due to the longer generation interval.
- Individual management is not seen as a priority, since visual assessment and mob-based data seems to be sufficient, and the extra time and skills required for individual management and data analysis is not seen as a good return on investment for time.
- Whilst the access to technical expertise and guest speakers have been highly valued, the peer-to-peer discussions are listed as the main benefits of being involved within a local producer discussion group.
- An important enabler for adoption is excellent facilitation to create open and transparent discussions, built on trust and sharing of the good, bad and the ugly.
- A supported learning environment with access to researchers, technical experts, and veterinarians will lead to learning and support within and outside the group.
- Practical on-farm sessions are an important source of peer-to-peer learning and drive the adoption of more investigative approaches to solve management issues.
- There is an opportunity to utilise and distil products such as case studies out of this project in extension messages to beef producers across Southern Australia.
- The linked heifer reproduction R&D project describes 'WAPE' as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of joining. The percentage of heifers achieving WAPE has the initial number of heifers set at weaning, however this is an unrealistic target, since most producers only select a portion of their heifer weaners to join in a self-replacing system. The recommendation is that the percentage achieving WAPE should be assessed from joining through to second calving.
- One of the questions that hasn't been fully answered within this project is whether increasing heifer conception rates to 88-90% actually translates into an increase in profitability or not. Further work needs to be done in this area to model the impact of beef reproduction rates on profitability of beef enterprises.

6 References

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Pitchford, W.S; Pitchford, J.M: Alexopoulos, J.G; and Hebart, M.L. Genomic Analysis of Purebred and Crossbred Angus Cows Quantifies Heterozygosity, Breed, and Additive Effects on Components of Reproduction. *Animals*. **2022**, 12, 61.

Agriculture Victoria factsheet: Condition scoring of beef cattle**:**
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Figure 2: The digestibility of pasture species in a typical season at Hamilton (similar to South East region) Source: Greener Pastures for South West Victoria, 2006.
http://www.lifetimewool.com.au/tools/pastures.aspx

MLA Tips and Tools, Animal Health and Welfare: Preventing calf scours in suckler beef enterprises and Treating calf scours. https://www.mla.com.au/research-and-development/animal-health-welfare-and-biosecurity/diseases/infectious/calf-scours/

Link to project page where powerpoint presentations from this session are located, along with short videos from the day: https://www.mackillopgroup.com.au/blog/reproductive-health-and-management-practices-for-beef-heifers/1577113

Maia grazing: https://www.maiagrazing.com/

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More Beef from Pastures modules: https://mbfp.mla.com.au/

Early weaning of beef calves: https://agriculture.vic.gov.au/livestock-and-animals/beef/health-and-welfare/early-weaning-of-beef-calves

Beef cattle drought feeding guide: https://www.feedinglivestock.vic.gov.au/wp-content/uploads/2019/02/Beef-cattle-drought-feeding-guide.pdf

Mac Troupe Oration from Grassland Society Conference Proceedings July 14th, 2022 – "Have we lost direction in the way we manage pastures?"

Table 1 and 2: Calendar for worm and fluke control in spring and autumn calving herds
https://paraboss.com.au/annual-program/western-victoria-and-south-australia/

Zooetis: https://www.zoetis.com.au/livestock-solutions/southern-beef/index.aspx

7 Appendix

7.1 Communications

7.1.1 Producer case studies

These case studies may be used either in part (i.e. put into MLA case study templates) or in their entirety in the future, in consultation with the project manager and producers involved.

Measure and monitor to fine-tune management

"Scotglade Pastoral," Conmurra, SA

Author: Elke Hocking, Elke Hocking Consulting

SNAPSHOT

Name	Peter and Elke Hocking.
Location	Conmurra.
Average rainfall	600mm.
Enterprise	310 breeding cattle (80 heifers and 230 cows), 400-600 weaner cattle and 2800 1st X ewes. (2022/2023 16,585 DSE's total).
Farm area	1,280ha effective grazing area.
Soil type	Sand over clay through to black flats.
Pasture base	Phalaris, sub-clover, and annual grasses.

Business goal (philosophy)

"To operate a professional, sustainable, and profitable business model across the property aggregations involving beef cattle and prime lamb."

Background

In 2014, Peter and Elke Hocking commenced their livestock business 'Scotglade Pastoral,' 30kms South of Lucindale, running a small number of breeding and trading cattle, along with a self-replacing first cross ewe prime lamb enterprise, joining first cross ewes to White Suffolk terminal sires. In 2020, they purchased an additional 500-hectare property at Coonawarra. With no sheep infrastructure on the new property, they embarked on increasing their cattle breeding and trading operation.

The purchase of the property coincided with the Kangaroo Island (KI) fires in 2020, where 70kms of fencing and 3,000 bales of hay was burnt on Elke's parents' property on the island. Following the fires, around 500 cattle and 1,500 first cross ewes were transported to the Scotglade pastoral properties which led to an integration between the properties, where all first cross ewe lambs and heifer replacements were bred on Kangaroo Island and only Terminal sires for both beef and lamb are used in the South-East properties.

Around this time, Elke, who also runs a consulting business, *Elke Hocking Consulting*, commenced managing the MLA funded Mackillop Farm Management group's "*Reproductive Health and Management Practices for Beef Heifers producer demonstration site (PDS)"* project. Peter and the overseer of the Coonawarra property, Mark Denman, participated in the project and individually recorded liveweights on a monitor mob of 2020 drop heifers from joining through to their second calving.

Throughout the three-year project, they introduced foetal ageing at pregnancy scanning to split their entire herd into early and late calvers, as well as doing fertility testing of all bulls prior to joining. Individual recording of the liveweight of both cows and their calves at different times throughout the year was made easy with the installation of a new cattle crush with inbuilt scales and the use of a Tru-Test XR 5000 and Tru-test XRS2 eID stick reader. With a composite herd, the range in cow mature reference weights was huge and so as well as splitting mobs on earlies and lates, they also split the mature aged early mobs into 'heavies' (>630kg) and 'lights' (<630kg) to better match their nutritional requirements in late pregnancy and early lactation.

Reproduction results

The monitor mob heifers were purchased from KI in December 2020 and consisted of weaned autumn 2020 drop Hereford Angus x Simmentals, which were subsequently joined to an Angus bull as heifers and then a Limousin bull for their second calving. Table 1 shows the key joining and calving dates for the monitor mob.

Table 1 – Key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned December 2020. Average weaning weight December 2020 = 306kg. Final average liveweight December 2023 = 642kg

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 339-424kg) BCS 3-4	Average daily gain (ADG) joining	Heifers PTIC (Average lwt 532kg)	Calving (Average lwt 536kg)	2nd joining (Lwt range 516-645 kg, BCS 3-4)	ADG joining	Calving (Average lwt 595kg)
650 kg	15th Aug- 19th Sept 2021	1.5kg /hd/day	16th Dec 2021	24th May 2022 (start)	22nd Aug-26th Sept 2022	1.0kg /hd/day	1st June 2023 (start)
FOO kg DM/ha	1200 kg +			<800 kg	1200 kg +		<800kg
Pasture quality	Very high			Very high	Very High		High
ME requirements (MJ ME/kg DM)	53			152	167		167
Supplementary Feed				12kg/hd/day Cereal hay			12kg/hd/day Pasture hay

Heifer replacements were purchased in December 2020 and individual weights and calving records kept through until re-conception after having their second calf. Heifers were on a rising plane of nutrition throughout joining with an average daily gain around 1.5kg per head per day and achieved a conception rate of 78% (Table 2).

Table 2 – Heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2019 (Q)	2020 (43)	.	.	66%	2021 (July)	96%	7%	0%	63%
2020 (R) Heifer	2021 (35)	339kg BCS 3.0	52%	78%	2022 (June)	96%	9.7%	0%	73%
2021 (S) Heifer	2022 (60)	450kg BCS 3.5	69%	75%	2023 (April)	97%	5.3%	0%	71%

Table 3 shows that the empty heifers had marginally lighter weights at weaning and the start of joining but had caught up by the end of the joining period. Heifers were only joined for a period of 35 days and the heifers that were lighter at the start of joining may not have commenced cycling before the bull came out. The source herd also has a moderate number of twins and there are normally a proportion of "*free martins*" in the mob, which are infertile. This has not been a significant economic issue though, since more heifers are purchased and joined than what has been required for replacements, and any heifers not pregnancy tested in calf (PTIC) get sold as yearling finished animals into premium grassfed supply chains.

Table 3 – Liveweights (kg) of heifers of monitor mob

Reference Cow liveweight (lwt) 650kg, condition score (BCS) 3.0	18th Dec 2020	4th Aug 2021	28th Sept 2021	18th Dec 2021	19th April 2022	27th July 2022	30th Nov 2022	12th May 2023	30th Nov 2023
Management	**Weaning**	**Pre-joining**	**Post-joining**	**PTIC**	**Pre-calving**	**Pre-joining**	**Post-joining**	**Pre-calving**	**Post-joining**
Empty heifers average liveweight (kg)	296	336	424	534	Sold				
PTIC heifers average liveweight (kg)	307 (47% ref wt)	340 (52% ref wt)	423 (65% ref wt)	532	536 (82% ref wt)	520 (80% ref wt)	651 (100% ref wt)	596	642

By their second joining, the 2020 drop (R) heifers had reached 80% of their mature reference weights and achieved 90% re-conception rates (Table 4), with 57% conceiving in the first cycle, 33% 'lates' and 10% dries. By the third joining, second calving cows had reached 100% of their mature reference weight, however only 88% re-conceived which was lower than expected, but was most likely due to one bull breaking down 12 days into the joining period.

2021 drop (S) heifers were joined in July 2022 for an April calving in 2023 to allow more time for recovery of heifers prior to their second joining for a July calving in 2024. These were joined for 60 days, as noticeable cycling and bull activity was observed at 42 days. The introduction of foetal ageing to identify earlies and lates was used to make heifer calving management easier. This mob achieved 75% conception rates (Table 2), with 43% earlies, 32% lates and 25% dries and went on to achieve 97% conception rates in their second joining (Table 4), with 80% conceiving in the first cycle, 17% 'lates' and only 3% dries.

Table 4 – Second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2019 (Q)	2021 (42)	BCS 4+	.	92%	2022 (June)	96%	0%	0%	88%
2020 (R) Heifer	2022 (38)	520kg BCS 3-4	80%	90%	2023 (June)	100%	0%	0%	87%
2021 (S) Heifer	2023 (55)	530kg BCS 3-4	81%	97%	2024 (July)	.	.	.	.

It is interesting to note that the Q-drop (2019) heifers were calved down between the 11th of July and the 23rd of August 2021, then re-joined on the 27th of August to the 8th of October (after the last calf was dropped) and effectively brought back to a June calving, achieving 92% re-conception rates. This success can be explained due to the high quality and quantity of feed on offer, cows being at their recommended 80% of standard reference weight and high BCS at their second joining. Figure 1 shows that cows can return to first cycle post calving as early as 31 days if they are in good condition and achieve 90% re-conception rates if high feed is on offer. In this case, the mid-point of calving was around the 25th of July, meaning that when the bull went in, they would have been around 33 days post calving. This is useful information to know what can be achieved if calving time ever needs to be brought back for other management reasons.

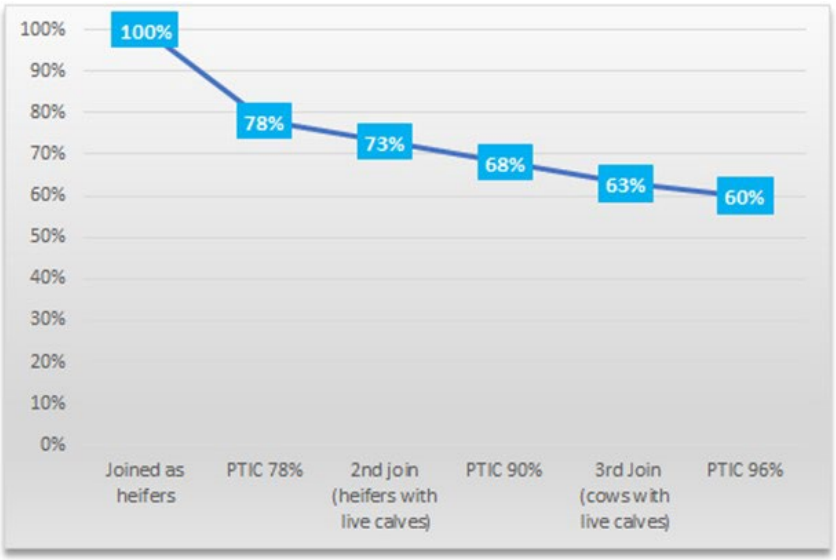
Figure 1 – Effect of nutrition post-calving and condition scores of cows at calving on cow reproductive performance

	Feed availability*	Condition score at calving		
		1.5–2.0	2.5–3.0	3.5–4.0
Days to return to first cycle post calving	high feed	49	38	31
	low feed	65	45	38
Pregnancy rate	high feed	84	92	90
	low feed	70	87	86

Source: ReproActiv, Zoetis

The linked heifer reproduction R&D project describes 'WAPE' as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first 6 weeks (2 cycles) of joining. Once a heifer has achieved WAPE, they tend to proceed to be productive and robust as a mature cow. The following graph (Figure 6) shows the greatest decline in numbers occurred after heifer joining and that 68% of heifers had achieved WAPE by their second joining. By the third joining only 60% of those originally joined as heifers remained in the mob.

Figure 2 – Heifer loss from first time joining through to PTIC after second calving (R – 2020 drop)



Bull Fertility

Despite a relatively young bull team, the property has had a high rate of bull breakdowns in the past couple of years, with issues ranging from lameness through joining and broken penises. In 2023, bull fertility testing was conducted on bulls prior to the joining period. This including checking both structural soundness as well as microscopic assessment of volume and motility of sperm.

Bull testing results:

- 1xP (2018 drop bull) = OK
- 2xQ (2019 drop bulls) = 1 no sperm, 1 dead sperm
- 4xR (2020 drop bulls) = 2 OK, 1 no sperm, 1 excellent sperm
- 2xS (2021 drop bulls) = OK

Three out of the nine bulls tested failed the fertility testing (33%) and were re-tested again eight weeks later, with only one being of sound fertility after the second test and the other two culled. Peter commented that "the bull fertility testing was an eye-opener because the bulls we thought should be OK weren't and so it meant we didn't use those bulls and were able to purchase another bull prior to joining rather than have a disaster with heaps of cows not in calf."

Foetal aging

The introduction of foetal aging in both heifers and cows to identify 'earlies' and 'lates' has had several advantages within the business. Following pregnancy scanning six weeks after bull removal from the mob, dries are separated from the mob and finished to grassfed markets, whilst earlies and lates can be run together as a single mob until three to four weeks prior to calving when they are drafted down the race according to alerts on the eID wand to split into earlies and lates. This allowed more targeted pre-calving health treatments and the ability to meet nutritional requirements more accurately. Early calving mobs are located closer to the yards at the point of calving, with late calving mobs moved closer 3-4 weeks later. Allocation of paddock or supplementary feed was managed separately for the different mobs according to their nutritional requirements suitable for either late pregnancy or lactation, including supplementation of minerals for grass tetany prevention following calving.

Following pregnancy scanning following the 2023 joining, foetal aging enabled further evaluation of non-performing bulls. The following mobs (mixed age mature cows) were single sire mated, with bulls being rotated after 3 weeks.

- Mob 1: P bull 1st 27 days, R bull 2nd 28 days: 33 joined – 9 earlies, 16 lates, 8 dries.
- Mob 2: R bull 1st 27 days, P bull 2nd 28 days: 30 joined – 19 earlies, 7 lates, 4 dries.

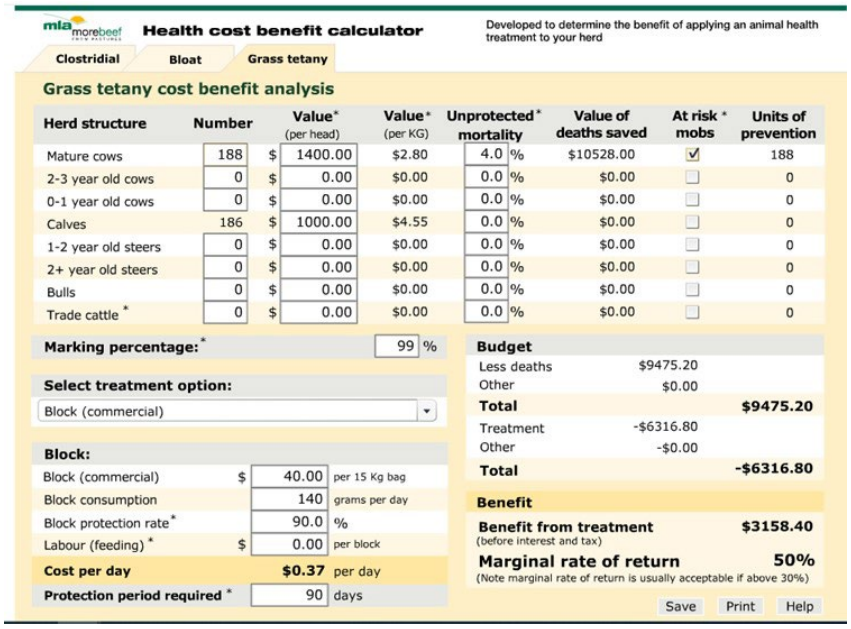
This indicates that the P bull potentially had lower fertility, with a lower percentage being conceived during the time he was in with each mob.

Grass Tetany prevention

Animal health was also a key focus throughout the three-year project. The MLA health cost-benefit calculator (Figure 3) was used by Peter and Elke following the 2023 calving season, to determine the cost effectiveness of using mineral blocks for the prevention of the metabolic condition of Grass Tetany. This beef enterprise has seen previous mortality rates from Grass Tetany as high as 8% within certain mobs and since then, they have conducted preventative management strategies including the provision of hay and mineral blocks during peak risk periods (lactating cows in cold weather conditions grazing on less than 1200 kg DM per ha).

Calving in June and July, $6,300 was spent on mineral blocks and put out during June through to August 2023 (90 days) to 188 breeding cows. The following figure shows the return on investment was 50%, assuming that cow sale values are around $1,400 per head and that a 4% loss due to Grass Tetany was prevented through treatment. No labour cost was added since blocks are normally put out when checking calving cows.

Figure 3 – MLA Health cost benefit calculator



The sensitivity analysis in Table 5, shows that the break-even point for spending money on Grass Tetany prevention is around 4% mortality rates across the herd and cow values of only $1,000 per head, or alternatively a mortality rate of only 2% with a cow value of $2,000. It is important to note that this value is possibly understated as it doesn't include the loss of growth rate in the orphaned calves which is likely to be higher if the calf is orphaned at a younger age.

Table 5 – Marginal rate of return sensitivity analysis with different cow values and mortality rates

	Mortality%				
Cow value / head	**1%**	**2%**	**4%**	**6%**	**8%**
$1,000	-73%	-46%	7%	61%	114%
$1,200	-68%	-36%	29%	93%	157%
$1,400	-62%	-25%	**50%**	125%	200%
$1,600	-57%	-14%	71%	157%	243%
$1,800	-52%	-4%	93%	189%	286%
$2,000	-46%	7%	114%	221%	329%

Calving time

Peter and Elke have experimented with different calving times throughout the last decade and along with production records, they have also kept a keen eye on profitability metrics through their participation in a regional financial benchmarking group. With lower cost of production of beef seen in benchmarking data from those businesses calving in late winter / spring, they have settled on a 1st of July calving for 2024 cows and a mid-March/April calving for heifers. With calving times from February through to September within the Beef PDS group producer businesses, the ability to have discussions regarding the pros and cons of the different calving times has also been invaluable in the decision-making process for calving time. Grass tetany has always been an issue for autumn calving cows with peak lactation coinciding with the main risk periods from June through to August where the feed on offer is often low and cold wet conditions pre-dispose cows to this condition. Moving to a later calving in July/August should reduce the risk period from a period of 3 months to 1-2 months, further reducing the cost of preventative treatments using mineral blocks.

With this time of calving, calves will be weaned at around 5 months of age when the pasture quality falls in December/January and calves supplemented with high quality hay, whilst cows should only require a minimal amount of supplementary feed due to lower requirements through summer and autumn until they reach late pregnancy in winter and lactation in spring. Calves will be marketed after their second spring into the feedlot market at weights of 400-500kg, rather than being finished to liveweights of 600kg. The aim is to better match their animal requirements to the pasture availability, and further increase stocking rates, without the need for additional supplementary feed and thereby reduce their beef cost of production.

Since heifers require more checking throughout calving and don't tend to suffer as much from grass tetany issues, mid-March/April calving time was set for the 2024 calendar year for heifer replacements. The split calving time also allows Angus bulls to be used twice in the herd, effectively reducing bull costs across the herd and gives more time for heifers to regain condition prior to joining as second calvers.

Key production and financial performance indicators

With involvement in a local financial benchmarking discussion group, whilst the Hocking's production key performance indicators have been good, their cost of production has been creeping up, impacting on their net profit. With supplementary feed and labour being the main contributors to increased cost of production in their beef enterprise, a change in calving time will hopefully help to reduce some of these costs. The following table shows the cost of production and production metrics for the last benchmarking year analysed, as well as their 5-year average.

Table 6 – Key production and financial performance indicators for Scotglade business

	5-year average	2022/2023 KPI's
	5,664 beef DSE's	6,963 beef DSE's
Annual stocking rate	13.3 DSE's per hectare	13.1 DSE's per hectare
Cost of production	$2.49 per kg liveweight	$2.80 per kg liveweight
Production – average liveweight (lwt) of animals sold	557 Kg	576 kg
Production kg lwt / ha	299 kg	305 kg lwt /ha
Production kg lwt / ha / 100 mm rainfall	46 kg	42 kg lwt / ha /100mm rainfall
Production kg lwt / DSE	23 Kg	23.4 kg / DSE
NET PROFIT	$256 per hectare	$288 per hectare

Benefits of being involved in the Beef PDS

When asked what the main benefits had been from their involvement within the Beef PDS, Peter said "the peer-to-peer learning has been invaluable – learning and hearing about other people's experiences helped to validate some of the key messages. The variation in management systems within the group was extensive with a range of calving times, different breeds, different animal health plans and different target markets. It was great to be able to pick out which things would be most suitable to adopt within your own production system". He also said that "the animal health information from Veterinarian, Sean McGrath, has given me a much better knowledge of how to manage grass tetany, worms and other animal diseases."

Key messages

- Bull fertility testing prior to joining alleviates poor reproductive performance and 'surprises' following joining.
- Pregnancy testing six weeks following bull removal and foetal aging allows for early identification of dries for marketing and allocation of feed to better match nutritional requirements of pregnant heifers and cows.
- Foetal aging is a useful management tool to reduce the time spent checking calving cows due to having a tight calving period for each mob of cows.
- Having heifers in good body condition score following calving and on high quality pastures through joining enables excellent re-conception rates, even with a short interval post-calving.
- Having a yearly animal health plan is critical for the preventative management of grass tetany, worms, and other diseases.

Lessons learned

- The installation of a cattle crush with inbuilt scales and the use of an eID stick reader has made it easy to record liveweights whenever livestock are yarded for other management treatments. The use of 'alerts' on the stick reader has allowed easy drafting of animals on pregnancy status or other traits of interest.
- Having a good understanding of the range in body cow mature reference weights in the herd is critical to be able to calculate their nutritional requirements throughout the year, as well as setting more accurate target joining weights.
- Practicing body condition scoring and pasture assessment at each session reinforced these skills so that they have now become regular management practices throughout the year.
- With a loss of 40% of heifers from the monitor mob (due to an inability to conceive and/or raise a calf) from first time joining through to second calving, adequate numbers of heifers need to be joined initially to ensure there are enough for herd replacement.

Fertility, fertility, fertility

"Amherst," Willalooka, SA

Author: Ashlee Carslake-Hunt, Tailored Livestock Consulting

SNAPSHOT

Name	Ian and Louise Johnson.
Location	Willalooka.
Average rainfall	480ml.
Enterprise	Breeding Cattle: 6,800 joined cows & 2200 replacement heifers & 2000 ewes.
Farm area	15,000 hectares.
Soil type	Sandy loam over limestone, lucerne on high ground, black peat flats at Beachport.
Pasture base	Lucerne, phalaris, ryegrass and sub-clover main pasture, starting to implement chicory. Standing crops for calving heifers.

Business goal (philosophy)

"Leave properties in better condition than what you acquired, including infrastructure, amenities, soil fertility and pasture health. Create a good environment for people and livestock to be part of. Ensure good preparation to be able to take advantage of expansion when a favourable property comes on the market."

Background

Ian and Louise Johnson called Naracoorte home on a predominantly prime lamb family property, until the family bought Amherst (2,070Ha) at Willalooka in 1992. As time progressed, succession planning meant that Ian and Louise took over Amherst in 2002 and Ian's passion for cattle saw him focus on breeding cattle. Sheep were still part of their plan however, more opportunistically taking advantage of potential gross margins on a trade. Originally, the Johnson's were known for their Simmental stud at Naracoorte. Over time they used Angus for crossbreeding to take advantage of hybrid vigour, however, the Simmental bloodlines were not conducive to the environment at Willalooka which saw Ian move to a self-replacing Angus herd.

Ian's philosophy is to try and have maximum stocking rates when he has the maximum feed availability. For the Willalooka property, this means calving in February for heifers and February/March for cows. Autumn calving works well for Ian's system as he can begin weaning early in September. Weaned replacement heifers are then transported to their Beachport property (which has a longer growing season) to grow out, while steer calves are marketed in November to feedlots and backgrounders. At sale they average 290-380kg at eight to nine months old. For nearly 20 years the Amherst circuit sale has been predominantly where the Johnson's sell all their surplus stock. As they've expanded, newer properties such as Wittalocka and Moville have become regular stops in the circuit sale.

The Johnson's future goal is to reach 7,000 Angus self-replacing breeding cows, with 85% of their own heifers, which was the motivation to join the "*Reproductive Health and Management Practices for Beef Heifers*" Producer Demonstration Site project, run by the Mackillop Farm Management Group and co-funded by MLA and the MLA Donor Company with producer contributions. With reproduction being the predominant focus in their large self-replacing system, Ian purchased a pregnancy scanner and learned how to use it himself. Today, Ian uses foetal aging as an integral part of his management strategy in conjunction with forecasting feed availability as it gives him options and flexibility around which breeders to sell or retain. Ian looks for shape, cover and do-ability when selecting females and bulls. Using EBV's has been a fundamental part of the improvement in fertility and growth, more specifically scrotal circumference and 200-day growth. Ian's non-negotiables are that bulls must be minimum breed average for those traits and after that he considers phenotype and temperament. Setting the bar high on too many traits can often rule a lot of bulls out of your catalogue.

Yearly management program and animal health

With calving in autumn often bringing about nutritional challenges for calving cows due to high energy requirements and low digestibility and energy in pastures, Ian buys in all his fodder as no hay is grown on the properties. The pre-joining program starts with a booster 5 in 1 vaccine for cows in January and the bulls receive an additional Pestivirus and Vibrio vaccine when they are semen tested. The heifers do not have a vaccine program for Bovine Viral Diarrhoea (BVD - also known as Pestivirus) which Ian understands there's a handful of dries as a result. There are varying opinions on Pestivirus, and the immediate impacts on your herd compared to long-term herd immunity. One of the benefits of participating in the Heifer Reproduction PDS was having access to veterinarians, consultants, and other producers to discuss animal health issues and subsequent management solutions.

Ian decided to get blood tests done on a representative sample of the group to assess the existing status of immunity of the animals in the herd. As they were accumulated from multiple properties within the farming business, they were bled in groups from their property of origin to enable trace back to those properties in case there was evidence that one may be worse than the other.

24 serum samples were tested for Bovine Pestirus antibody ELISA, of which 22 of the 24 tested were antibody positive for BVD and two were negative. This indicates that the majority of the mob had been exposed to the virus and are therefore already carrying immunity, so there was no need to vaccinate this group of animals. Annual testing of heifers pre-joining is an effective tool to reduce the need for vaccination and assess the risk to heifers leading into their first joining. This process can also be used to reduce the numbers of persistently infected (PI carrier) animals, should Ian wish to follow that path. There is obviously BVD present in the breeding herd, and so future management of the virus will be considered, however, after budgeting the cost of two Pestivirus vaccine doses to 1,800 heifers compared to a few dry heifers, the producer made the decision not to vaccinate.

Heifers are joined at Beachport and then trucked to Willalooka to calve in February. Pre-calving, the heifers receive a mineral injection and drench. To mitigate the need to supplementary feed hay to heifers, Ian grows oats or ryegrass crops and instead of harvesting them, they're left as standing crops for heifers to consume after calving. This provides adequate nutrition to meet their energy requirements during lactation. In his experience, it's also resulted in higher heifer conception rates on their second joining when compared to feeding just hay.

Eleven years ago, after attending Beef Week in Queensland, Ian purchased a *ReproScan* pregnancy scanner. Prior to purchasing the scanner, he was manually pregnancy testing 2,500 cows yearly. Since purchasing this machine, it's meant multiple people across his properties have learnt to use it, which provides him with management flexibility. They've also recently purchased a second BCF Ultrasound machine, for approximately $18,000. As they expand their enterprise and grow their cow herd, it allows two properties to be scanning at the same time. Annually they're pregnancy scanning between 8,000 to 9,000 cows and heifers, and by owning the equipment they're avoiding management delays which can be costly.

At weaning, any dry cows are sold to either the sale yards or direct to processors. Having such a strong emphasis on fertility means any dry heifer or cow is culled. At Amherst for ease of management, weaning starts on a Monday, where cows are pregnancy tested and calves are drafted based on sex. The weaners are treated with a 5 in 1 booster vaccine, drench and Selenium / B12 injection. They're then yard weaned for five days with hay and water, after which they're moved to smaller weaning paddocks. Staff members walk through the calves daily and expose them to the yards during this time to improve handling.

Reproduction results

Year-on-year, Ian is typically getting mid to high 80's for the percentage conception rate in heifers, with some variation due to seasonal challenges due to not being supplementary fed in the lead up to joining. Heifers being joined for the second time are looked after more closely on standing crops to ensure rebreeding rates are higher.

This year Ian joined 2,190 heifers naturally and a small group to artificial insemination (AI). Collectively, the entire group pregnancy tested in calf (PTIC) at 83% with an empty rate of 17% after an eight-week joining. 64% were identified as early (pregnant in the first four weeks of joining) and 19% were identified as lates (pregnant in the last four weeks of joining).

By owning a pregnancy scanner, it provides reliability and flexibility to pregnancy test as early as the day of bulls out or later at weaning, and the number of heifers PTIC can be split into early and late cycles. On the day the bulls are removed from the mob, they're yarded, and all heifers are pregnancy tested. It takes 30-35 days of pregnancy for a foetus to be detectable on the pregnancy scanner. By scanning at bulls out, the only detectable foetuses are the early conceived heifers. This gives a calving period of three to four weeks, depending on genetics and their gestation length. Any heifers that were undetectable at bulls out are re-scanned five weeks later which gives Ian the 'late' calvers. Any heifers undetectable at this stage are dry and turned onto the lucerne/ryegrass pastures and sold to the Coles Graze grass-fed program.

When Ian first joined the Heifer Reproduction PDS he was in the process of reducing heifer joining length from eight weeks to six weeks. After presentations from Wayne Pitchford, University of Adelaide and discussions with other producers that were doing four week joining periods, it sparked interest in further reducing and manipulating joining length. Wayne discussed how reproductive pattern is highly repeatable in cows and emphasised the importance of having heifers "wet and pregnant early" to achieve one calf per cow per year. Although Ian's heifers are joined for eight weeks, foetal ageing has allowed Ian to strategically condense his calving spread to only four weeks. It also provides his business with flexibility to sell excess heifers PTIC which is particularly useful in unfavourable seasons and when PTIC heifers are at a premium in the market. The excess heifers are

more appealing to buyers because of the short calving period. If Ian retains all early PTIC heifers this year, there will be 1,400 heifers calving in four weeks across all his properties.

Due to the purchase of additional properties and his herd being in a growth phase, Ian has held onto all PTIC heifers in previous years. Once the new properties have reached appropriate stocking rates, there will be an opportunity to sell more PTIC heifers and have a lower portion of heifers calving down each year. He'll continue to refine and adapt his joining length and scanning strategies once restocking rates for new properties have been achieved. Having a smaller portion of heifers calving down annually will boost his conception rates and weaning rates.

Benefits of being involved in the Beef PDS

Within the Heifer Reproduction PDS, speakers emphasised the importance of measuring the standard reference weight (SRW) of mature cows. SRW is typically used as a benchmark to assess whether individual animals are meeting their growth targets for reproductive success. SRW refers to the weight of a grown-out cow, empty at body condition score (BCS) 3. Dependant on season, Ian's cows are typically 585kg at BCS3 however, there could be up to 70kg variance due to body frame. Once SRW has been established, the critical mating weight (CMW) of heifers can be calculated. CMW is 60-65% of a cows SRW. Underweight heifers may experience delays in reaching puberty, have lower conception rates, and face challenges in maintaining a pregnancy. Ian's CMW target is a minimum of 350kg within the first cycle of joining for heifers. Although they do not weigh heifers at first joining, their brothers reach this weight at approximately nine months of age, so he's confident CMW is reached within the first cycle of joining.

From discussions within the Heifer Reproduction PDS it was apparent that feed on offer (FOO) and its quality also influences conception rates. For example, if heifers are 400kgs at time of first join and they lose weight throughout joining, that can be as detrimental as not achieving the CMW targets in the first instance. Body condition score targets are also important, and nutritional talks have cemented what Ian had already experienced in poorer seasons, where the energy and digestibility of the pasture is not sufficient for an autumn calving heifer to reach desired mating weights and body condition scores.

In the last three years, Ian has joined 85-90% of all heifers to build up numbers for newer properties. Overall, his herd is very young, with the majority being heifers, second and third calvers. Ian's goal for next year is finding the balance of retaining enough heifers to fulfill his replacement requirements and having as many heifers conceiving in the first four weeks of joining. To start with, it's likely to be a juggling act however, Ian's estimated he'll need 1,000-1,200 replacement heifers per year. The Heifer Reproduction PDS has given him targets to make educated decisions around numbers to join. "I think I'll need around 2,000 heifers to gain 1,200 heifers pregnant in first four weeks of calving, so I'll put that into practice next year'. Ian's long-term plan is to have more mature cows within the herd because their conception rates sit at around 95%, rather than joining the entire drop of heifers.

It was evident from discussions within the group that some of the producers were also doing financial benchmarking, with Elke Hocking running benchmarking groups locally. The financial information these businesses were able to disclose to the group was invaluable for looking at how different calving systems stack up. Generally, Ian knows his cost of production is higher

because he's an autumn calver and economically it's better for him to purchase hay than to grow it. However, given the growth of his business and being part of the group, it's motivated him to change software and accountants, so he's better equipped for future financial decisions. Ian enjoyed participating in the PDS as he always came home motivated with some key messages that challenged his thought processes around management decisions.

Figure 1 – Ian Johnson, Willalooka (left) with Sean McGrath, Millicent Veterinary Clinic (right) at one of the Beef PDS on-property workshops.

Key messages

- Wet and pregnant early (WAPE) is a measure that describes a heifer successfully getting in calf, raising a calf and getting back in calf within the first six weeks (two cycles) of joining. Once WAPE is achieved, heifers tend to be productive and robust as mature cows.
- Foetal aging is beneficial to identify those heifers in your herd that are "wet and pregnant early", to condense calving spread to a four-week period as well as having the flexibility to sell surplus late calving heifers, which is particularly useful in unfavourable seasons.
- It is important to know your standard reference weight (SRW) of mature cows to determine target joining weights for heifers. SRW refers to the weight of a grown-out cow, empty at body condition score (BCS) 3.
- Look after heifers prior to their second joining by matching their nutritional requirements to achieve higher re-breeding rates.
- The critical mating weight for heifer joining is 60-65% of the herd's SRW.

Lessons learned

- Having a greater proportion of mature cows within the herd will enable better fertility overall, with mature cows achieving 95% conception rates. Understand your herd structure to determine heifer replacement requirements.
- Access credible information from veterinarians and consultants and assess the cost-benefit of animal health treatments within your own business.
- Being involved within a group enables peer-to-peer discussions which challenge your current thought processes around management decisions and motivate you to look closely at what changes are practical within your business and what can improve your productivity and profitability.

Fine-tuning management practices pays dividends

"Saltwell Pastoral Co," Reedy Creek, SA

Author: Elke Hocking, Elke Hocking Consulting

SNAPSHOT

Name	Michael Cobiac and Catherine Bell.
Location	Reedy Creek.
Average rainfall	600mm.
Enterprise	640 breeding cattle (180heifers and 460 cows), 300 yearling heifers, 260 yearling steers.
Farm area	1,100ha grazing plus 250ha native vegetation.
Soil type	Grey sandy loam (Chelestan), loamy sand (Gumlea). Fertiliser 150kg/ha single super.
Pasture base	Annual ryegrass, sub-clover and some Phalaris and fescue.

Business goal (philosophy)

"To grow the existing capital base for the benefit of the family within a suitable risk appetite and risk profile."

Background

Michael Cobiac returned to the family farm 'Chelestan' in 2010, which at that stage was a mixed livestock enterprise with Hereford Shorthorn cross cows calving in Autumn for turnoff into the weaner markets, along with a self-replacing Merino flock and Dual-purpose sheep enterprise. Michael purchased the farm from his family in 2014 and by 2019, Michael and his wife purchased another property "Gumlea," 20kms away from the home property. Throughout the last few years, Michael has transitioned the business to a fully self-replacing Angus herd calving in August/September to supply 400 to 500kg yearling cattle for the feeder market.

After joining a financial benchmarking discussion group in 2015, run by Elke Hocking Consulting and supported by Holmes and Sackett (now Aggregate), the exposure to a wide range of calving systems along with financial information from these businesses, emphasised to Michael that spring calving systems tended to be lower cost, higher profit businesses. As a sole owner/operator, the appeal of being able to run a greater number of DSE's per hectare with a cattle enterprise led him down the path of land and herd expansion.

After purchasing "Gumlea", Michael followed a logical set of priorities with an initial focus on increasing stocking rate through the purchase of cattle, followed by capital expenditure on infrastructure improvements such as fertiliser, laneways, water, and cattle yards for both properties. Throughout this time, he recognised that his cattle reproduction and weaner growth rates weren't as good as he would like, so in 2020 joined the "Reproductive Health and Management Practices for Beef Heifers" Producer Demonstration Site project, which was run by the Mackillop Farm Management Group (MFMG) and co-funded by MLA and the MLA Donor Company with producer contributions.

As a commercial producer in rapid expansion mode, with an old set of cattle yards, he was unable to do a lot of the individual animal measurements throughout the project. Despite this, he found the linkage with the Adelaide University's MLA R&D project "*Optimising heifer development and management to increase whole herd productivity*" was invaluable as it gave him access to up-to-date research information on body condition, liveweight and growth rate targets for optimum reproduction results that could be readily adopted into his management system. He also gained a lot of knowledge from the technical presentations from local veterinarians and livestock consultants, along with learning practical tips on what works and what doesn't from other producers within the group. He said, "it was always reassuring to talk to other producers and realise that he wasn't the only one that had made a mistake or hadn't seen an issue coming that he thought he should have. Everyone has issues and you're not alone. It has also been good to realise what's good about your enterprise too – having an awareness about what's considered normal results, along with where the opportunities are to improve."

Figure 1 – Michael Cobiac enjoyed talking to other producers within the group throughout the three-year Beef PDS. He is pictured on the left with Romain Devaud from 'Konetta', Kingston, and on the right with Darren Simon from 'Woodrise', Beachport.

Yearly management program

Since 2015, Michael has moved his time of calving from autumn, through to a winter June/July calving system, to now calving on the 1st of August. He said "calving at the end of winter/early spring gives enough time for animals to get over their minimum body condition in autumn and minimises the risk of having them calve down in low body condition score (BCS). You also have green feed for the cows through lactation, and joining in November enables the cattle to be on a rising plane of nutrition going into joining."

Michael has also done the MLA PGS "Pasture Principles" workshop and previously implemented a year-round rotational grazing system. However, he has found that set-stocking through calving in mobs of around 50 cows is preferable as it reduced the amount of mismothering in his herd. Following calf marking, cows are boxed together in mobs of around 100 for joining, and then rotationally grazed through the spring period to optimise pasture quality and quantity. Paddock size on the property ranges from 20 to 40 hectares. Bulls are put out at a rate of 3 bulls to 100 cows for a 6-week joining and pregnancy testing is done in February/March.

Calves stay on the cows through summer, to ensure they get adequate nutrition from the combination of milk and dry pasture. Weaning occurs in February/March, when calves are around 5-6 months old to prevent too much condition being lost from the cows. Weaners are then required to be supplementary fed on good quality hay through autumn, whilst the cows only receive supplementation if seasonal pasture quality and quantity is low.

After one of the Beef PDS technical sessions which was held through Autumn, on matching the feed availability with the animals' requirements, Michael worked out he didn't need to feed much based on his cows' requirements during that time compared to the autumn calving herds within the group, but he realised he did still have to feed them something. "Having these seasonal workshops helped me make more timely and appropriate feeding and animal health decisions following the workshop", Michael said.

Michael's involvement with the PDS brought him into contact with vets and consultants early in the project and raised his awareness to potential issues with worms in cattle. As a result, he started working with Veterinarian, Sean McGrath to develop an annual comprehensive animal health program. This has involved not only working out what animal health treatments to give animals at what time, but also the discipline to better monitor cattle body condition score and give nutritional supplements where required. Having a sole cattle enterprise and higher stocking rates, Michael suspected his worm burden had increased on the property and was contributing to lower weaner growth rates.

At weaning, heifers receive 7 in 1 and Pestiguard vaccinations, whilst steers receive a 5 in 1 vaccination. All weaners are now treated with an injectable worm drench, whereas previously Michael had been using pour-on backliners. Weaners now also receive copper, cobalt and selenium injections around three to four times per year.

The weaners are weighed in August the following year at 12 months old, to ensure they are on track to reach their target weights of 400 to 500kg. The aim is to have all weaners (except for replacement heifers) sold to feedlots between mid to late October and mid-November.

Figure 2 – Michael Cobiac, Reedy Creek (left), discusses his bull selection and animal health program with Sean McGrath from the Millicent Veterinary Clinic (right) at the December 2021 Beef PDS workshop.

When asked about any down sides of changing his calving time, the main issue has been the reduced ability to sell dry and cull cows following weaning at the end of summer, as cows were lower in both weight and body condition at this time. Culling is done primarily on inability to deliver or raise a calf, temperament, and any other structural issues. Whilst there could be an opportunity to capture better value for his cull cows through carrying dry cows through autumn and into the following spring, he is not prepared to have less area for his breeders and young growing animals on the property.

Genetics

Due to wanting to increase his herd numbers as fast as possible, Michael initially focussed on selecting bulls with above average fertility and calving ease traits and moderate growth rates. The EBV's he prioritised were days to calving, scrotal size, rib and rump fat, calving ease (direct and daughters), gestation length and average birthweights. Prior to participating in the Beef PDS, he was happy to pay less attention to growth before accepting lower calving ease and fertility. Since participating in the group, one of the presentations from Adelaide University showed the overall importance of growth rate to profitability and in the ability to achieve target liveweights for optimum reproduction, so he is now prioritising growth more than previously and looking at 400-day weight EBV's within his bull selections.

Reproduction results

The following table shows the key dates and feed on offer for the monitor mob (2020 drop, purple R tag) heifers from their first joining through to their second calving.

Table 1 – Key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned March 2021

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 365-385kg) BCS 3.5	Average daily gain (ADG) joining	Heifers PTIC (Average 420kg, BCS 3.2)	Calving (Average lwt 450kg, BCS 2.8)	2nd joining (Lwt range 420-500kg BCS 3.5)	ADG joining	Calving
650 kg	12th Oct to 6th Dec 2021	360g /hd/day	30th Jan 2022	22nd July 2022 (Start)	24th Oct to 6th Dec 2022	Maintain-increasing	3rd August 2023 (start)
FOO kg DM/ha	2500 kg		1200 kg	1000 kg		1.9kg /hd/day	2500 kg
Pasture quality	Medium		Low=4MJ ME/kg DM	High			Very high
ME requirements (MJ ME/kg DM)	53		60	122	167		
Supplementary Feeding			Pasture hay (annual ryegrass and clover 8.9MJ)	3kg/hd/day ryegrass and clover hay			

Table 2 shows a significant improvement in heifer conception rates from baseline levels of 53% to 84%. The project started in December 2020, so more of an emphasis was placed on getting heifers to target weights prior to joining in 2021, resulting in 84% heifer conception rates and 77% of the 2020 drop able to be re-joined as second calvers. Conception rates of second calvers was subsequently 95% (Table 3), with 93% of cows weaning calves from those joined as second calvers. With such good results for the monitor mob, it meant that by their third joining, Michael had retained 72% of those initially joined as heifers (Figure 3).

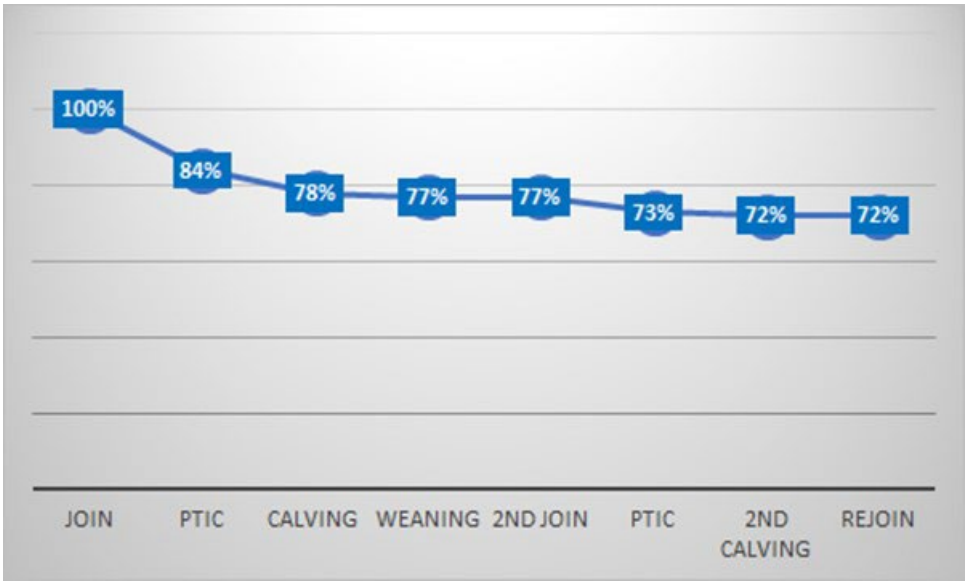
Table 2 – Heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2018 (P)	2019 (53)	.	.	53%	2020 (Feb)	93%	6.9%	0%	49%
2019 (Q)	2020 (53)	.	.	.	2021 (Feb)	.	.	.	.
2020 (R) Heifer	2021 (55)	385kg BCS 3.5	70%	84%	2022 (July)	93%	8%	0.5%	77%

Table 3 – Second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2018 (48)	.	.	91%	2019 (June)	98%	0%	0%	88%
2018 (P)	2019 (53)	.	.	.	2020 (July)	.	.	.	.
2019 (Q)	2020	.	.	.	2021 (July)	.	.	.	.
2020 (R) Heifer	2022 (43)	500kg BCS 3.5	80%	95%	2023 (Aug)	99%	0%	0.6%	93%

Figure 3 – Heifer loss from first time joining through to PTIC after second calving (R – 2020 drop).



Key production and financial performance indicators

Michael's historical conception rates over his entire herd have bounced around due to changing his system so much and also due to some animal health issues, however he feels that going forward, he is well placed to capture both the reproductive and growth rate potential of his herd. The following table shows his current stocking rate and the range of cost of production for his business since 2017, along with the 5-year average beef production and net profit for his beef enterprise. His target cost of production is $2 per kg liveweight, to enable him to achieve a good profit margin in most years.

Table 4 – Key production and financial performance indicators

		2022/2023 KPI's
DSE's	13,750 (2021/2022)	12,915
Stocking rate	12.5 DSE's per hectare (2021/2022)	11.9
Cost of production	95c per kg lwt (2017) to $2.56 per kg lwt (2021)	$2.25
	5-year average	**2022/2023 KPI's**
Production – average weight of animals sold	525 kg	485 kg
Production kg lwt / ha	228 kg	248
Production kg lwt / ha / 100 mm rainfall	38.2 kg	41
Production kg lwt / DSE	19 kg	20.9
NET PROFIT	$314 per hectare	$503 per hectare

Benefits of being involved in the Beef PDS

When asked what he thought the main benefits had been from his involvement within the Beef PDS, he said "my animal health management is better than it ever was, which is translating into better weights in my current weaners. Giving timely nutritional supplements and using effective drenches on young stock seems to have been beneficial." His August born, 12-month-old steers recently weighed an average of 350kg, whilst heifers (who hadn't been treated for worms when steers were treated) had a lower body condition score and average weight of 310kg.

"Involvement in the PDS has also helped me focus on which are the important metrics to pay attention to.

- It's highlighted what data is worth measuring and looking at to make decisions.
- In the absence of being able to do individual measurements on-farm due to a lack of facilities, I have relied on the scientific and technical presentations from others within the group to get the latest best practice targets and guidelines for my production system.
- Previously 285kg was thrown around as an accepted target weight for joining, however this project has shown that a more accurate target joining weight for heifers is 60-65% of the cow mature weight.
- The most important data for me to collect will be body liveweight and BCS targets and then putting what I've learnt into practice to achieve these targets. I realise I need to put more emphasis in managing my heifers from weaning to yearlings, so I get as many in the right BCS and weight range for joining.
- With a mature reference weight around 550kg, my target joining weight is 360kg. The conception pattern so far suggests that I'm getting about 65-70% of heifers conceiving in the first cycle and with a 5-6 week joining my overall conception rate is around 85%. I would still like to increase that."

Going forward, now that my herd numbers are more stable and I have a good set of cattle yards with weighing facilities, I would like to look at individual weights rather than mob-based weights so I can cull underperforming animals and make heifer selection replacement decisions based on individual data such as growth rates." Other management practices he will implement this year includes foetal aging his heifers into early and late calvers and bull fertility testing. The latter has been driven home by discussion of other people's results within the group of relatively young bulls failing fertility testing prior to joining and stories of poor conception rates due to bull issues (both structural and fertility related).

"The Beef PDS has been valuable as I feel it has underpinned the benchmarking I've done. Most farmers make production decisions and benchmarking is just the financial analysis and consequence of those decisions. This project gives me a better understanding of what the production system requirements are and has allowed me to see the benefits of having healthy animals in being able to achieve good productivity and profitability."

"Going into phase 2 of my beef business development will be a lot more data recording to use for decision management. I've seen peers within this project doing a lot of data recording and then valuing and using that information to make decisions. I would like to be that professional. Being able to split animals into groups based on their weight gains and using this information along with pasture data to get a good handle on production and be able to do forecasts for marketing will be very useful."

"Since moving from an autumn-calving weaner system to a late winter/early spring calving system producing yearling steers for feedlot entry has meant that at any time, I have a greater proportion of my herd that is young and growing at a premium price (for feedlot entry) and increased kilograms of liveweight per hectare being produced from my beef enterprise. Alongside this, I've had a significant reduction of supplementary feeding costs through autumn by not needing to feed lactating cows through this period. I will still feed cows in late autumn

depending on the FOO at the time as well as feeding weaners, but the amount of hay is much less." Michael said his beef enterprise has been a bit 'lumpy' with the integration of so many different management practices such as rotational grazing, best practice nutritional management for achieving good reproductive rates, animal health preventative treatments and changing calving times, all whilst trying to build his herd through business expansion. He feels like he is finally getting all the moving parts integrated into his production system so that in the not-too-distant future, his beef enterprise will be functioning like it's supposed to.

Key messages

- Record keeping and data management is useful to make informed decisions to improve productivity and profitability and to identify where the biggest losses are occurring in your system.
- Target weight for heifer joining is 60-65% of mature cow weight.
- Having heavier heifers in better body condition score at joining will result in higher conception rates.
- Understand what your animal nutritional requirements are at any given time during the season.
- Be competent in being able to measure feed on offer and the quality of pastures to ensure livestock nutritional needs can be met, and supplement where required.
- Having an annual animal management and health plan is beneficial, with preventative animal health and nutritional supplementation assisting to achieve target weights and achieve genetic potential.
- Peer to peer learning within producer discussion groups is valuable to realise you aren't the only one who makes mistakes and to see what management practices are working and what's not.
- Being involved in a producer demonstration site allows you to watch and learn from others (both presenters and producers) so that you don't always have to trial everything yourself.

Lessons learned

- Changing your management practices, in particular your calving time, has implications throughout the rest of the production system.
- Recognise the need for assistance from consultants, veterinarians and other producers who have experience in the system you are moving to.
- Get your priorities right within your business. Select the things that will give you the biggest bang for your buck and have the biggest impact on your business. Once these things are sorted, then identify what other opportunities there are to improve productivity and profitability.

Insights into maximising hybrid vigour and herd fertility in a self-replacing beef herd

"Rivoli," Rendelsham, SA

Author: Ashlee Carslake-Hunt, Tailored Livestock Consulting

SNAPSHOT

Name	Graeme and Michele, Tyson and Taryn Smith.
Location	Rendelsham.
Average rainfall	770ml, 670-700ml long term average.
Enterprise	750 breeders. 14,340 DSE's. 12.6 DSE/ha.
Farm area	1,230ha grazing & 150ha vegetation.
Soil type	10% Black clay loam, 10% black peat and 80% shelly grey peat.
Pasture base	Cocksfoot, phalaris, fescue, ryegrass, chicory, plantain, strawberry clover, some sub-clover & lucerne.

Business goal (philosophy)

"*To ethically produce quality beef and implement sustainable practices that will be passed on for future generations."*

Background

The Smith Family has been farming in Rendlesham since 1912 and has continued this tradition for four generations. Graeme, who is the third generation, returned to the family property in 1976. Traditionally the Smiths were a sheep and cattle mixed enterprise, until the wool downturn in the mid-80's saw Graeme make the transition out of sheep to an entire Hereford herd of cattle. In more recent times, his son Tyson, who is fourth generation, returned to the family property in 2015 and together they have been refining their beef enterprise. The family's commitment to adapting and incorporating new ideas led them to join the "*Reproductive Health and Management Practices for Beef Heifers*" Producer Demonstration Site (PDS) project in 2020. This was run by the Mackillop Farm Management group (MFMG) and co-funded by MLA and the MLA Donor Company with producer contributions.

The Smiths have a strong business focus on genetics and over the years Graeme made several management decisions to enhance performance in this area. He recalls switching to Angus bulls over the Hereford heifers due to improved calving ease, 'calving down Hereford heifers can lead to more calving assistance.' In their pursuit of improvement in fertility and calf growth, Graeme and Tyson initiated a new breeding strategy in 2016. This involved incorporating Angus and Black Simmental bulls into their program, aiming to harness the advantages associated with hybrid vigour. This approach capitalises on the superior genetic traits and overall robustness exhibited by offspring compared to their parents. Today their autumn calving herd is approximately 30% Hereford, 30% Angus and 40% Black Baldy's with an influence of Black Simmentals, and they're turning calves off at 20 months of age at approximately 600kgs to the Teys Australia grassfed program.

They have consistently prioritised fertility, to make improvements in their self-replacing cattle herd. They actively integrate new research into their management strategies and established an artificial insemination (AI) program in the 1970's, which has now been further fine-tuned in the past five years, condensing calving to a six-week period and utilising foetal aging. They continue to develop techniques and refine how they utilise the information gathered. Being involved in the PDS project has given them access to up-to date research and key professionals in the industry, which has reaffirmed their confidence that they're moving in the right direction. Additionally, receiving insights from fellow producers in the group, where they share practical tips on both successful and unsuccessful practices, has proven to be invaluable.

Yearly management program and animal health

The Smith's manage a self-replacing autumn calving herd and they prioritise the careful management of both bulls and females before joining. Taking steps to prevent any unforeseen issues and ensure a successful breeding program, all bulls are semen tested annually for fertility, regardless of how long they've been on the property. Graeme said it's prevented several potentially poor joining's by picking up infertile bulls before joining, rather than at scanning.

All heifers undergo a Pestivirus treatment plan. They're given the first initial dose at the end of February/start of March, and they receive the booster shot at the start of April, six weeks before joining. Throughout this period, heifers also receive Anipro nutritional supplement to aid in pasture utilisation and overall health of the animal. All heifers undergo a fixed time artificial insemination (AI) program with freshly collected semen and are followed up with a natural mating to catch any heifers that did not conceive in the first cycle to AI. This results in 3 cycles in a six-week mating period. Graeme and Tyson also AI approximately 200 of their best Angus and Hereford cows. Cows are inseminated with frozen semen from AI centres or from bulls they've assessed at sales and negotiated to purchase semen. All other cows are naturally mated using bulls at 1 bull per 30 cows with a six-week mating period.

Joining in May can bring about nutritional challenges due to low feed on offer (FOO) around the break of the season. 2023 was exceptional with an early break, however, quality FOO in May during joining can often be difficult to manage. Graeme and Tyson prioritise chicory, lucerne and clover-based pastures for heifers and second calvers that are still growing out. They take advantage of urea and ProGibb applications five to six weeks prior to joining for extra pasture growth. Their breeding stock are managed to ensure they're increasing condition in spring to

get through the winter when pasture quality is lower. They target condition score to be 3-3.5 at joining, which is essential for enhancing fertility in the lead up to their AI program.

In January, breeders receive a vaccine, *coppernate*, vitamin B12 and selenium injection pre-calving. Calving is managed by bringing heifers and cows to their home block at Rendelsham for ease of checking and being close to the yards for anything that may need assistance. Foetal aging provides benefits to their management through calving, with heifers and cows brought to calving paddocks based on the cycle they became pregnant for improved pasture management. They're well monitored during calving and supplementary fed 5kg/hd/day of clover/ryegrass hay to assist in meeting high energy requirements at calving and through peak lactation. Throughout the winter months, cows and calves are supplementary fed hay to improve digestion of the pasture by providing crucial functional fibre at a time where the pasture is low in neutral detergent fibre and rapidly fermentable. Hay aids in preventing subacute ruminal acidosis (SARA) and grass tetany, although the Smith's do not typically experience grass tetany in their herd. Calves are well conditioned to machinery and people due to supplementing hay which makes weaning easier.

Graeme and Tyson wean all calves at approximately six to seven months of age at an average of 270-280kg liveweight. They are paddock weaned into pastures that have been spelled for an extended period, on average the FOO is 6,000 kg/DM/ha. Calves are set stocked for a week, electric fences and waters are checked daily, however they aren't disturbed through this time. Calves are then split into steers and heifers and given animal health treatments. At weaning, the steers receive a 5 in1 vaccine and the heifers a 7 in 1 vaccine, with both also receiving a multimin injection, Hydro B12 and worm drench. After calves have been processed, they're rotationally grazed in large numbers to increase stocking pressure on rapidly growing spring feed. This aids in maintaining high quality pastures to match higher energy and protein requirements for weaners to gain weight post weaning.

When classing heifers they take out the tail, along with anything not true to type including size and temperament. Any heifers that don't fit what Graeme and Tyson are looking for as a breeder are treated like steers. The steers are held onto and sold the following November to Teys, at approximately 300-320kg carcase weights. Graeme and Tyson know the first cycle crossbreds will be the first group ready for sale and have the confidence to forward contract those numbers. Mature cows are culled for feet, age, milk or scanned empty and are sold into markets such as Teys or AMG, usually dressing up to 330kg carcase weights.

Artificial Insemination (AI) program

The Smith's use Nationwide artificial breeding centre for their services in artificial insemination (AI) programs, to AI all heifers and a portion of their best cows. Selecting genetics has been an integral part of their business, using BREEDPLAN Estimated Breeding Values (EBV's) they are focusing on 600-day weight, scrotal size, eye muscle area, gestation length and birth weight. In their experience gestation length has been highly accurate, when they use bulls with a high negative score those heifers will normally calve earlier. One of the benefits of AI is to gain access to genetically superior bulls from Australia and internationally, which speeds up genetic gains within their herd.

Graeme and Tyson have purchased frozen semen in the past however, they've switched to using fresh semen on the day of AI for heifers. This is to utilise genetics they've already purchased and

reduce the cost of purchasing all frozen semen. One of their non-negotiables is semen testing on all bulls one month prior to mating and AI to ensure they're using quality semen on the day of insemination. Bulls are milked and their fresh semen is used to AI all heifers that day, and bulls are used as a backup 10 days after AI. Overall joining length for the heifers, including AI and natural mating, is six weeks or three cycles. Foetal aging is then used to separate the heifers conceived during AI versus natural mating.

Reproduction results

During the PDS project, producers followed a monitor mob of heifers from the 2020 drop (Purple 'R' tag). Table 1 below shows the key dates and feed on offer for this mob from weaning through to the end of their second calving and Figure 1 shows the feed on offer that was available during their first joining. Table 2 shows the conception rates and calving data for heifers from 2017 drop through to the 2021 drop, whilst Table 3 shows the conception rates and calving data from 2017 drop through to 2020 drop.

Table 1 – Key dates and feed on offer (FOO). 2020 drop (purple tag, R) heifers weaned October 2020, (average liveweight 270 kg)

Reference Cow average liveweight (lwt), condition score (BCS) 3.0	Heifers joined (Lwt range 350-380kg) BCS 3-3.5	Average daily gain (ADG) joining	Heifers PTIC	Calving (Average lwt 550kg, BCS 3)	2nd joining (Average lwt 560kg BCS 3.0-3.5)	ADG joining	Calving
700	12th May - 22nd June 2021	73g /hd/day	20th Aug 2022	19th Feb 2022 (Start)	19th May -30th June 2022		26th Feb 2023 (start)
FOO kg DM/ha	2200 kg			1500 kg	1800-2200kg		1500 kg
Pasture quality	Med-high			Ryegrass, cocksfoot, strawberry clover 6MJ	Very high quality green sub-clover		High quality
ME requirements (MJ ME/kg DM)	53			152	167		
Supplementary feeding	Apply urea and pro-gibb			Lucerne chicory clover pasture hay every 3 days			Balansa hay

Figure 1 – Feed on offer following joining (July 2021)

Table 2 – Heifer data

Year of drop	Joining year (join length)	Av. lwt 1st joining & BCS	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2017 (N)	2018 (66)	320kg BCS 3.0	46%	98%	2019 (Mar)	91%	11.5%	1.9%	53%
2018 (P)	2019 (65)	320 kg BCS 2.0	46%	79%	2020 (Mar)	93%	5%	3.7%	71%
2019 (Q)	2020 (48)	320 kg BCS 3.0	46%	83%	2021 (Mar)	90%	1.5%	0.8%	50%*
2020 (R) Heifer	2021 (41)	350kg BCS 3.5	50%	77%*	2022 (Mar)	98%	2.9%	0%	43%**
2021 (S) Heifer	2022 (42)	320kg BCS 3.0	46%	87%	2023 (Mar)	93%	2.3%	0%	81%

**Noticed abortions, **PTIC heifers sold before calving*

Table 3 – Second calving data

Year of drop	Joining year (join length)	Av. lwt 2nd joining & BCS	% SRW	Cow conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Cow mortality %	Weaning % (to joined)
2017 (N)	2019 (42)	560kg BCS 2.0	80%	95%	2020 (Feb)	96%	1%	2.1%	90%
2018 (P)	2020 (42)	560kg BCS 4.0	80%	88%	2021 (Feb)	81%*	0%	0%	80%
2019 (Q)	2021 (42)	560kg BCS 3.0	80%	81%	2022 (Feb)	99%	1%	0%	77%
2020 (R) Heifer	2022 (38)	560kg BCS 3	80%	90%	2023 (Feb)	98%	0%	0%	88%

**No dead calves (early abortions?)*

As can be seen in Tables 2 and 3, they have had some variable results due to some issues with dystocia, reproductive diseases causing abortions and the use of AI which has sometimes produced variable results. On the monitor mob (2020 drop), Graeme and Tyson trialled two rounds of AI on these heifers and one cycle of natural mating. They hadn't attempted it before and were curious whether conception rates would improve. In the first cycle of AI the heifers conceived 60-65%, the second cycle of AI they conceived 10-20% and the third cycle resulted in a handful of pregnancies through natural mating. They decided the extra workload of yarding heifers for a second cycle of AI, stress that placed on the heifers and costs of additional hormones and milking bulls was not a profitable exercise. In the future heifers and elite cows will be exposed to one AI cycle and two cycles of natural mating. They're happy they've trialled it and have taken valuable lessons away from this trial.

Working with a veterinary consultant along with involvement within this group has enabled this business to continue to fine-tune their beef breeding enterprise to achieve exceptional results over the last couple of years, in particular 87% heifer conception rates for 2021 drop heifers and a subsequent 81% weaning rate to heifers joined.

Benefits of being involved in the Beef PDS

Over the course of the PDS project, there were presentations from veterinarians and researchers on the importance of producers measuring the standard reference weight of mature cows at condition score 3, to calculate the critical mating weights of their heifers and second calvers. A heifer should be 60-65% and second calver should be 80-85% of their standard reference weight. Critical mating weights are used as a guide to determine if body weight is impeding their ability to hit puberty, conceive and maintain pregnancy.

Heifer condition and management is paramount to their reproductive performance. Dr Wayne Pitchford from the University of Adelaide discussed the importance of heifers being "wet and pregnant early" (WAPE), defined as a heifer successfully getting in calf, raising a calf, and getting pregnant again in six weeks. Conception patterns in cattle are also highly repeatable, which reinforced Graeme and Tyson's ideologies of ensuring good body condition score, improving feed availability, and providing animal health and nutrition products to set heifers up for an early conception pattern that's repeatable.

For Graeme and Tyson, one of the most significant learnings from participating in the PDS project was listening to Dr Wayne Pitchford present on heterosis or more commonly known as hybrid vigour. They learned you can keep the progeny out of a black-baldy dam crossed with a black Simmental sire and breed from them. In the past they'd been told not to keep the progeny sires from the third genetic cross. Wayne clarified that was not the case and the genetics in the sires are more valuable therefore, they're going to incorporate these sires in their breeding plan this year. Another benefit of multiple genetic crosses from a Hereford based herd, has been the dramatic decline in the need for dehorning due to the poll gene in the Angus and black Simmental breeds. Hybrid vigour can also attribute to higher growth rates in progeny and improved maternal traits in dams, which they will continue to capitalise on.

In a pasture fed system, pasture management is extremely important which is why they have also completed MLA Profitable Grazing Systems, Pasture Principles workshop through Pinion Advisory. Since doing the course, they have purchased a plate meter and do regular pasture assessments. Throughout the Beef PDS Project, each session included a pasture assessment led by Tim Prance. They found these practical assessments beneficial to hear about tips and tricks regarding grazing strategies from others within the group during group discussions.

Graeme and Tyson also do financial benchmarking through Pinion and ensure they keep an eye on their cost of production, which is around $1.91 per kg liveweight of beef produced. They have enjoyed going to other properties and seeing similarities in their farming systems and learning from others' experiences, both good and bad and comparing the profitability of different management systems. Graeme said it was excellent the other producers in the group felt comfortable enough to share information which is so useful and thought provoking. They always took something away from each session and feel privileged to have visited such a wide variety of properties.

Key messages

- Crossbreeding capitalises on hybrid vigour, where offspring exhibit superior genetic traits and overall robustness compared to their parents.
- BREEDPLAN is an integral part of choosing bulls and making genetic gains.
- Foetal aging is done six weeks after bulls are taken out and is a useful tool to separate cycles to improve pasture management, supplementary feeding and oversee the right mobs when calving. In this system foetal aging is also used to separate the heifers that conceived during the AI program, which is useful to group progeny from different sires.
- Using two rounds of artificial insemination on a commercial herd did not result in a positive return on investment. It increased the number of times yarded, injected, and mustered during joining, increasing stress on the people managing the insemination and the heifers.
- Urea and ProGibb applied five to six weeks before joining is a useful tool to increase feed on offer (FOO) throughout joining in May.
- Pasture management and being flexible to set stock versus rotationally grazing is important to get the most out of pastures.
- The critical mating weight for heifer joining is 60-65% and for a second calver joining is 80-85% of the herd's standard reference weight.

Lessons learned

- Being involved within a group enables peer-to-peer discussions which provokes alternative thinking around management decisions to improve overall productivity and profitability.
- Accessing credible information from veterinarians, researchers and consultants is critical when making changes to management, and to reaffirm you've made good decisions by trying new practices.
- Hybrid vigour increases the growth rates of progeny and improves maternal traits in dams. Graeme and Tyson learned you can keep the sire from a Black Baldy dam cross Black Simmental sire and breed from them. They will incorporate this into their breeding plan this year.

Acknowledgement for all case studies

Reproductive Health and Management Practices for Beef Heifers PDS

This co-contributor Producer Demonstration site project is funded by Meat and Livestock Australia and the MLA Donor Company along with producer contributions and ran from December 2020 to December 2023.

A group of 19 participating beef businesses, representing around 18,000 breeding cows across 50,000 ha of farmland within the Limestone Coast region have been monitoring the liveweights and body condition scores of their 2020 drop heifers, joined in 2021 to calve in 2022. This monitor mob of heifers have been followed through to their second calving in 2023.

Producers within this project were eager to adopt best practices guidelines, along with collecting on farm data to assess the effectiveness and practicality of guidelines for animal health and management practices to improve the reproductive efficiency and profitability amongst their herds.

The purpose of the group was to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving, by understanding and adopting best practice monitoring and management practices for animal health, condition scoring and nutritional management.

Delivery partners and collaborators
Thanks to the MFMG team for your support of this project and to the regular participating consultants throughout the project for your technical expertise, Sean McGrath, Millicent Veterinary Clinic; Tim Prance, T. Prance Rural Consulting and Ashlee-Carslake-Hunt, Tailored Livestock Consulting. Also, thanks to the University of Adelaide staff involved in the "*Optimising heifer development and management to increase whole herd productivity*" project for ongoing collaboration, in particular Wayne Pitchford and Darren Koopman. Other technical delivery experts involved included Penny Schulz, Shulz Livestock; Andrew Whale, Apiam Animal Health and Gary Glasson, Zoetis.

Other supporters (not delivery partners or project collaborators)
Thanks to the 19 participating beef businesses within the Limestone Coast region who have been monitoring the liveweights, body condition scores and reproductive rates for their 2020 drop heifers from weaning through to their second calving in 2023. Thanks, must also go to Emma Peters (MLA graduate intern with The University of Adelaide (2020 -2021)) for conducting the initial producer interviews that initiated this project and her work in getting the project up and running.

7.1.2 How to conduct a post-mortem on dead calves.

Need to determine when they died – was the calf born dead or was it born alive?

- Look at the hooves – if the soft/feather like pad has been removed, the animal has been up walking around = born alive.
- Lung sample – float a small piece of the lung in a body of water – if it floats it means it is full of air, hence the calf has taken a breath = born alive. If the piece of lung sinks, there is no oxygen present, hence the calf has not taken a breath = still born.

Look for general abnormalities and disfiguration.

- Fused legs
- Swollen mussel and/or tongue
- Cloudy eyes (in-utero infection)
- Multiple heads
- Abnormal number of limbs

Begin the dissection process – ensure the animal is laying on its left side. As the rumen is on the left – this position ensures it is out of the way.

- Make an initial incision along the sternum (towards the underarm). Peel the front leg back and continue to run the knife along the abdomen towards the back leg. Break through the hip and spread the leg backwards. See the figure below.

Beginning from the last small rib, gently cut through into the abdomen taking care to not pierce any important organs. Run the point of the knife along the midline, peel back the skin layer to create a window. Extend the knife through the ribs and pull back/crack the ribs back.

Examine all internal organs – a healthy calf or a calf that has been born alive should have:

- Lungs pink in colour.
- Liver should have sharp edges.
- Minimal adipose tissue around the kidneys.
- A milk clot in the abomasum.

Collect all required samples – ensure you use personal protection equipment (PPE) when dissecting animals as some diseases are zoonotic (transferable to humans). Collect samples from:

- Gross abnormalities
- Lungs → pneumonia
- Gut fluid →infectious agent
- Faecal samples – straight out of the calves rectum is the best faecal sample → Worm egg count (WEC)
- Kidneys
- Spleen → pesti-virus
- After birth (cotyledons)

Put all samples in either a sealed sandwich back or plastic container. Ensure samples are taken to the vet/diagnostic lab within 12 hours of death. It is best to put a note in with your samples if you are unable to hand deliver them – this allows the tester to get the background picture.

Other things to note.

- Kidneys don't tell a lot in young animals – adipose tissue goes away quickly if the animal is up and running around.
- Fluid from the abomasum – exposure to an infectious agent – collect the fluid using a syringe, only need a couple of mls.
- If a calf is born alive but with fluid coming out its mouth, sit the animal up right on its cheat to allow the lungs to inflate. No need to hang the animal upside down.
- Stimulate breathing by touching the nose of the calf or by firmly rubbing the chest.
- Liver samples are more valuable in older calves. They are more accurate to test for trace elements/minerals than blood.
- >1% of abortions should be investigated.
- Gross deformities are random events which are developmental rather than disease related, although can have genetic deformities.
- 50% of 'PI' (pestivirus) animals will die by 18 months of age. Every 12 months after that a further 20% of PI's will die.
- A clear sign of selenium deficiency is retained membranes (afterbirth).
- Meconium-stained calves are a clear sign of a tough birth.
- If you haven't got fresh colostrum, packet colostrum can be purchased from resellers.

7.1.3 Media articles – MLA Feedback email newsletter, 16th Feb 2022

Producers band together to boost productivity

16 February 2022

The MFMG PDS group watches on during a practical session held in the cattle yards of one of the project's host properties.

Profit-boosting research

PDS has delivered $168.8M in total net benefits to participating producers as a result of completed projects between 2015-2021. In 2021-22 this will be equivalent to $10.8M in annual net benefits to participating producers.

On average, this means producers can expect an additional net benefit of $6/ha annually as a result of their participation in the program.

If you are interested in receiving regular updates about the PDS program, sign up at mla.com.au/pds

Applications open on 1 April for producer groups interested in pursuing new skills, management practices and technologies to improve their enterprise management through MLA's Producer Demonstration Sites (PDS) program.

The program supports producers to conduct research and build skills designed to increase the productivity, profitability and sustainability of their unique production systems.

Here's a look at one of the 70 PDS projects currently underway across Australia:

Projects for productivity

A PDS delivered by the MacKillop Farm Management Group (MFMG) is taking significant steps to improve heifer reproduction from weaning to second calving for more than 18,000 breeding cows across the Limestone Coast region of SA.

It supports producers across 20 beef businesses to develop best practice management skills for reducing reproductive losses while boosting cattle herd health, welfare and profitability.

PDS Project Facilitator and consultant, Elke Hocking, said the project came about after a survey conducted in conjunction with MLA Livestock Consulting Intern, Emma Peters, revealed strong interest in the initiative.

"We rang 15 producers across the Limestone Coast region, who indicated there was a large gap in beef extension and adoption services in the area and that they were eager to conduct a PDS project to address some common issues impacting animal health and reproduction in the region," Elke said.

"We put together a preliminary application for the project with MFMG and, after it was accepted by MLA, we then worked with the participating producers to get consensus on the project's focus before submitting our final application for the PDS project."

Building the foundations

Now in its second year of operation, considerable progress has been made as part of the project to build the group's capabilities in maximising herd reproductive performance.

"We've collected baseline data from producers about what their current reproductive records were and we're now conducting sessions to help producers adopt best practice management systems for optimum reproductive performance.

"This year, we'll be collecting reproductive data from our participating producers' heifers and discussing what they're observing, as well as how they're applying what they've learnt in the first year to improve their heifer reproduction rates and get set up for the subsequent joining."

Regroup and reflect

Elke said effective coordination and evaluation were key to running a successful PDS project.

"My advice is to get help from a professional consultant, facilitator or a farming systems group to run your PDS if possible," Elke said.

"I also run an evaluation after each session we do as part of the project, so we can think about what we could do better each time.

"Continuous improvement is always essential if you want to get the most relevant outcomes for the project participants and ensure the topics covered are producer-driven."

Learning for life

Elke recommends producer groups interested in finding new ways to improve their enterprise consider applying to undertake a PDS, with the peer-to-peer learning and skill development facilitated by the program already proving invaluable to producers involved in her project.

"Producers appreciate having technical experts delivering sessions, but they really value getting out onto other people's properties and seeing how other producers manage their enterprises."

How to apply for a PDS:

MLA's PDS program calls for levy and co-contributor PDS projects on an annual basis. The 2022–23 PDS Open Call preliminary application round opens on 1 April 2022 and closes on 13 May 2022.

For terms of reference, project priorities and application forms, visit mla.com.au/pds

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7.1.4 Media articles – MFMG Trial results book, 2021, p122-123

21. Reproductive Health and Management Practices in Beef Heifers

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Funding Body: MLA
Project Code: P.PSH.1280

KEY MESSAGES

- Throughout 2021, 19 beef businesses within the Limestone Coast region have participated in this project and continue to build their knowledge and skills to optimally manage their breeding heifers through to second calving and improve profitability within their beef enterprise.
- Whilst the access to technical expertise is highly valued, the peer-to-peer discussions are listed as the main benefits of being involved in a local producer group.
- Producers within the group enjoy visiting a different host farm at each session and get value from seeing how other producers within the region manage their enterprises.
- One of the questions that is emerging from the group is whether increasing heifer conception rates to 88-90 % will translate into an increase in profitability or not. It is hoped that this project, through the data collected over the next two years, along with results of other MLA funded Research and Development projects in this field can effectively answer this question.

Background

This co-contributor Producer Demonstration site project is funded by Meat and Livestock Australia and the MLA Donor company along with producer contributions and will run from December 2020 to December 2023.
A group of 19 participating beef businesses, representing around 18,000 breeding cows across 50,000 ha of farmland within the Limestone coast region have been monitoring the liveweights and body condition scores of their 2020-drop heifers, joined in 2021 to calve in 2022. This monitor mob of heifers will be followed through to their second calving in 2023.

The project aims to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving. With a strong emphasis on peer-to-peer learning and support from a team of technical experts, consultants, veterinarians and industry representatives, it is well placed to achieve its objectives.

Activities

Now entering its second year of the project, considerable progress has been made in assisting producers build their knowledge and skills to meet the nutritional requirements of their breeding females to achieve optimum reproductive performance and set up for subsequent joining's. Since December 2020, several technical and interactive sessions have been held. Every session is conducted at a different host property from within the group, with producers assessing the monitor mob's condition score, nutritional requirements and assessing the quantity and quality of pasture available to meet those requirements.

Technical sessions have included understanding genetics and bull selection to meet a breeding objective, metabolic and animal health conditions and management, bull structure and fertility assessment, calf post-mortems, treatment of calf scours and discussions of the variety of calving times and management systems within the group.

Whilst the project focuses on optimising reproductive performance, producers are also encouraged to monitor other key performance indicators of profitability such as their cost of production and the amount of quality beef that can be produced per hectare to get a handle on where the balance is between reproductive performance, stocking rate and profitability.

Results & Discussion

This project will also have linkages with another MLA R&D project being run by The University of Adelaide, 'Optimising heifer development and management to increase whole herd productivity'. One of the key performance indicators referred to in this linked project is to achieve a conception rate of about 88-90 % as heifers and again as first-calf cows (from those that conceived as heifers).

Preliminary baseline data collected from within this group indicates that the average heifer conception rate for 2017, 2018 and 2019 drop heifers was around 75% with weaning rates of 67 %, whilst the average conception rates for 2017 and 2018 drop second calvers was 90% with weaning rates of 82 %.

One of the questions from the group is whether increasing heifer conception rates to 88-90 % will translate into an increase in profitability or not. To address this, the linked University project plans to develop a decision support tool to help southern beef producers and their advisors make management decisions to generate greater sustainable gains in productivity and profit. Once developed, this will be road-tested by producers within this group using their own data.

Conclusions

Peer to peer discussions at each session are proving to be extremely valuable, with continuous knowledge transfer of regional management strategies between beef producers within the group. This continues to be the highlight of the feedback from producers and listed as one of the main benefits of being involved in a local producer group.

Some producers within the group have started using veterinarians and private consultants to assist them develop yearly animal health programs for their livestock enterprises as they recognise the complexity of some of the metabolic and animal health issues within the region.

It is intended that activities within this beef producer group will extend beyond the life of the project and provide a platform for future extension and adoption initiatives for beef producers across the MFMG and Limestone Coast region.

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Photograph 1: Penny Schulz (Schulz Livestock), delivering on Genetics and Bull Selection to the Beef PDS group in December 2021 at Michael Cobiac's property, Reedy Creek.

Photograph 2: Michael Cobiac, host property producer from Reedy Creek, discusses his bull selection program with Sean McGrath from the Millicent Veterinary Clinic at the December 2021 Beef PDS workshop.

Photograph 3: Tim Prance demonstrating assessment of pasture quantity at Beef PDS December 2021 workshop.

7.1.5 Media articles – Grassland Society of Southern Australia Newsletter, Edition 345, December 2021, p6–8

CASE STUDY

By Tim Prance, T Prance Rural Consulting, Victor Harbor SA and Sam Bell, BN and JM Bell & Sons, Millicent SA

Mineral And Trace Element Spray Applications To Reduce Heifer And Calf Losses During Calving

The Bell family run a Hereford cow-calf operation at Millicent, Limestone Coast SA calving 450 Hereford heifers in March and 200 in August, all joined to Hereford bulls.

The Bells want to limit calf losses during calving due to uterine inertia resulting in still born calves. Heifer deaths are not high at around 1%, but calf deaths average 5-7% per year. The prevention of any heifer/calf loss is economically and socially worthwhile.

March calving heifers were supplementarily fed before and during calving with a mix of grass hay, clover hay, trail fed pellets and Molafos and had access to a reasonable amount of dry pasture. Estimated metabolisable energy (ME) intake in autumn before, and during, calving was 140 MJ ME/day, which slightly exceeds requirement following calving of about 130 MJ ME/day.

A total of 114 March calving heifers were condition scored before calving. Average body condition score (BCS) was 3.2 (42 heifers with a BCS = 3.5, 3 with a BCS = 2.5 and 69 with a BCS = 3).

These heifers were introduced to a calving paddock containing 5000 kg DM/ha dry phalaris stalks and leaves and annual grasses with an understory of 2000 kg DM/ha green phalaris leaves, strawberry clover and some kikuyu. Most of this paddock was sprayed on March 10 with a mineral plus trace element mix containing Epsom salt (magnesium sulphate) along with manganese, zinc, copper, cobalt and boron sulphates. A small portion was unsprayed.

August calving heifers were grazing pasture alone, before being introduced to the same calving paddock as above, along with three other calving paddocks. All four paddocks were sprayed in early July with the same mineral and trace element mix used in March, but with gibberellic acid and N added to the spray used in paddock #4. About half of this paddock (the same paddock as used for the above autumn calvers) was not sprayed.

Three of the August calving paddocks only contained 800 kg DM/ha high quality feed, so heifers were fed ad lib oaten hay containing 10 MJ ME/kg DM and 6% crude protein. Paddock #4 (same paddock used for the autumn calvers) contained 2500 kg DM/ha high quality feed in the sprayed area and 1500 kg DM/ha in the unsprayed area. Heifers were also fed ad lib oaten hay in this paddock but consumed very little of it.

ME intake at the end July was estimated to be similar to requirements in late pregnancy of 70 MJ ME/day, whilst intake following calving was 140 MJ ME/day.

August calving heifers were not individually body condition scored but were in slightly lower condition compared to the March calvers. Following calving they gained condition on the high-quality green pasture.

Observations by Sam indicated condition scores were consistent in late pregnancy for both times of calving - heifers weren't either gaining or losing condition at these times.

Calf losses

- **March calving:** 6% of heifers produced dead calves plus 5% had calving difficulties
- **August calving:** 5% of heifers produced dead calves plus 1% had calving difficulties

Andrew and Sam Bell are looking to reduce their heifer and calf losses.

Calving paddock March 11 2021
5000 kg/ha dry phalaris stalks and leaves + annual grasses. Understory approx. 2000 kg/ha green phalaris leaves, strawberry clover + some kikuyu

11/3/21 - Sample from sprayed area (from understory only). 70% green leaves 95% phalaris, 4% strawberry clover and 1 % kikuyu. 30% dead phalaris leaves

11/3/21 - Sample from un-sprayed area. (understory only). 70% green leaves –100% phalaris. 30% dead phalaris leaves

In the past, Bells have experienced less calf losses with the August calving heifers compared to the March calvers, but in **this case study there were minimal calf losses with the August calving heifers in the paddocks with short (800 kg DM/ha) paddock feed supplemented with high ME/ low protein oaten hay,** with most losses occurring whilst heifers were calving in the paddock with 2500 kg DM/ha high quality pasture and eating very little hay.

Data summary

Pasture in March: Plant tissue samples* were collected from the paddock understory which was mostly phalaris with about 70% green leaf.

- Phosphorus levels in both the sprayed and unsprayed sections were very low (about half recommended levels).
- Calcium levels in the sprayed section were more than adequate but were deficient in the unsprayed section.
- Magnesium levels were adequate in both sections.
- Potassium levels were high in both sections, but not high enough relative to calcium and magnesium to induce grass tetany (ratio <2.2 ** in both sections).
- Zinc, cobalt, selenium and manganese were adequate in both areas whilst molybdenum was high. Copper was very low in the unsprayed area, and very high where sprayed.

Pasture in August. The sample collected was much higher quality than the March sample, consisting of 98% green leaf which was predominately phalaris with some perennial ryegrass.

- Phosphorus levels in the sprayed section were higher than in March but still deficient, whereas phosphorus levels in the unsprayed section were adequate.
- Calcium levels were high in the sprayed section and marginally low in the unsprayed section
- Magnesium was low in the sprayed section and adequate in the unsprayed section
- Potassium levels were high in both sections (sprayed and unsprayed), and particularly high in the unsprayed section, but not high enough relative to calcium and magnesium to induce grass tetany in the sprayed area (ratio < 2.2). However, the grass tetany ratio was slightly above the ideal in the unsprayed area.
- Zinc, cobalt, selenium and manganese were adequate in both sections, whilst molybdenum was high. Copper was low in both sections.

** Details of the mineral treatments applied along with the leaf analysis results are available by contacting Tim Prance at t.prance@prance.net.au*
***Refer Module 6, MLA More Beef from Pastures manual*

Conclusion

- The March spray application had no impact on mineral content apart from perhaps calcium, although the calcium increase may have been "coincidental" because none of the spray treatments was replicated.
- Copper levels greatly increased with the spray application in March. The unsprayed area was deficient in copper and any deficiency in the heifers grazing this area would have been exacerbated due to high molybdenum levels.
- There was no apparent benefit in applying zinc, manganese, cobalt or selenium with either the March or the August sprays.
- The pasture over the whole paddock (including sprayed area) was deficient in phosphorus in March and still deficient in August.

- The August spray application had no impact on mineral content apart from perhaps calcium, and appeared to decrease the magnesium levels, although these effects may have been "coincidental" because none of the spray treatments was replicated.
- Copper levels were deficient in both areas in August and further exacerbated due to high molybdenum levels
- Feeding high ME/low protein oaten hay to supplement short green pasture seemed to reduce calf losses in August compared to heifers calving on adequate green pasture with minimal hay intake.

Discussion

- **Drawing conclusions from the differences between the treated and untreated areas should be treated with caution as this is a non-replicated demonstration, therefore we cannot be sure if the differences are real or due to chance.**
- The spray greatly increased pasture copper levels in March but not August. It is possible that rain in August washed the copper off the leaves. The only way of permanently increasing the copper content of pastures is with a copper application to the soil with an autumn fertiliser application.
- Molybdenum should never be applied to pastures or soil unless a legume leaf test indicates it is deficient.
- Despite the spray application, there were heifer/calf losses in both March and August calving, Heifer/calf losses were not due to overfat heifers.
- The grass tetany ratios were acceptable (or just slightly elevated) at both calving times in both the sprayed and unsprayed areas.
- **There was a large increase in feed on offer in August from 1,500 kg DM/ha to 2,500 kg DM/ha as a result of adding 6 g/ha gibberellic acid and 11 kg/ha nitrogen (as liquid N) to the July mineral spray application, but this did not appear to reduce August calving heifer losses.**
- The only apparent consistent mineral/trace element deficiencies (expressed as % dry matter) were phosphorus and copper. It is probable that there would be adequate intake of high-quality green pasture in August for heifers to obtain enough daily intake of phosphorus and copper despite the lower percentage in the dry matter. This may not have been the case in March.

18/8/21 - Sample from sprayed area 98% green leaves 80% phalaris, 10% per ryegrass, 5 % clover (strawberry + sub), 5 % fog grass

18/8/21 - Sample from un-sprayed area 98 % green leaves 70% phalaris, 20% per ryegrass, 5 % clover (strawberry + sub), 5 % fog grass

Calving paddock August 18, 2021
Untreated area about 1500 kg/ha feed on offer.

Calving p[addock August 18, 2021
Treated area about 2500 kg/ha feed on offer
Response due to gibberellic acid and liquid N

Summary

- If trace elements are required, apply with fertiliser in summer/early autumn. Ensure soil pasture phosphorus levels are adequate.
- Be wary of applying mineral sprays to pastures to solve calving issues resulting from the above.
- Improving legume content of pasture will increase the calcium and magnesium content of the pasture.
- Providing a high ME hay supplement may be beneficial.
- In the past, the Bells have experienced minimal calf losses (and minimal assisted calvings) with heifers calving before the due date.

7.1.6 Media articles – MFMG Seasonal Newsletter Summer 2022/2023

Reproductive health and management practices in beef heifers

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Key messages

- Collaborative projects enable a supportive environment for on-farm adoption to occur
- Measuring and monitoring the impact of liveweight, BCS, animal health, calving time and management on reproductive performance is beneficial for future management decisions
- Knowing the mature reference weight of your breeding cows is important to set target joining weights for heifers
- Reference weights are best taken two weeks after weaning and at BCS 3
- Pros and cons of autumn vs spring calving systems should be explored thoroughly before changing time of calving

Project Overview

This Producer Demonstration site (PDS) project 'Reproductive health and management practices in beef heifers' was set up to link in with the University of Adelaide's research project 'Optimising heifer development and management to increase whole herd productivity,' to achieve a faster rate of on-farm adoption of scientific research.

32 producers from 19 participating beef businesses, representing around 18,000 breeding cows across 50,000 ha of farmland within the Limestone Coast region have been monitoring their 2020 drop heifers for reproductive success in relation to liveweight, body condition score and animal health.

Background, activities, and overview

Now entering its second year of the project, considerable progress has been made in assisting producers build their knowledge and skills to meet the nutritional requirements of their breeding females to achieve optimum reproductive performance and set up for subsequent joinings.

Since December 2020, several technical and interactive sessions have been held. With four sessions per year conducted at a different host property from within the group, there is a strong emphasis on peer-to-peer learning as well as support from a team of technical experts, consultants, veterinarians, and industry representatives.

At each session, producers practice body condition scoring and pasture assessment, along with discussing the nutritional requirements of the different classes of cattle within the group. Technical sessions have included understanding genetics and bull selection to meet a breeding objective, hybrid vigour, metabolic and animal health conditions and management, bull structure and fertility assessment, tips for assisting difficult calving, calf post-mortems, treatment of calf scours, logistics of artificial insemination and pregnancy scanning and discussions of the variety of calving times and management systems within the group.

Figure 4. Tim Prance conducts a dry matter feed on offer assessment, supervised by Darryn Simon and Dr Sean McGrath.

Figure 3. Beef PDS members measuring and discussing pasture quality and quantity in relation to beef cattle nutritional requirements throughout the breeding cycle.

Figure 2. Beef PDS members practicing condition scoring beef heifers

Outcomes

Through the collaborative model between research, industry and advisors within this project, several producers within the group have seen the value of ongoing animal health, nutrition and pasture agronomy advice and have taken the opportunity to work with livestock consultants and veterinarians one-on-one, outside the formal group setting.

Through the process of monitoring liveweights of weaners and heifers, it became apparent that some producers weren't aware of the mature reference weight of their cow herd. Previous management guidelines have recommended that the target joining weight for heifers should be around 60% of the mature cow weight. The suggested time to get a reference weight for your herd, is to weigh your mature cows two weeks after their calves are weaned, preferably at body condition score (BCS) 3.0. Each additional body condition score is worth around 70-100kg (depending on breed), so if cows are at BCS 4 you would need to subtract this amount to determine what their weight would be at BCS 3.

With a wide range of calving times from February through to September within this project, it appears that the target joining rates may vary for autumn versus spring calving systems, and that a lower joining weight may be possible if heifers are on a rising plane of nutrition throughout joining. A facilitated session was run at a recent group meeting where producers discussed the pros and cons of the different calving systems in relation to their reproductive outcomes, practicality of management, supplementary feeding requirements, and profitability. Many producers refer to a spring calving system, but were calving in June or July, so it was important to firstly define the actual month of calving. Table 2 represents the timelines for three of the most common systems within the group.

Table 2 – Management calendar for three of the common calving systems in the Limestone Coast

Calving Time	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Autumn		Calving			Joining			Preg. T				Wean
Winter	Wean				Calving			Joining			Preg. T	
Spring		Preg. T		Wean				Calving			Joining	

The following tables (Tables 3-5) show some of the pros and cons listed by the producers for each calving system. This list is by no means complete but is a good starting point for producers to think about the logistics of implementing a different system within their business.

Table 2 – Pros and Cons of an autumn calving system

AUTUMN CALVING	PROS	CONS
Calving Feb-April Pasture – generally low-quality dry feed.	- Weather good for checking calving cattle (more hours of daylight and dry yards) - Potentially fewer calving difficulties (less chance of having excess nutrition in late pregnancy which can influence calf birth weight) - Potentially better weather during calf marking (dry yards)	- Weather can be too hot (>40°C in earlier months) - Loss of BCS through lactation through not meeting nutritional requirements. This is only a problem if BCS drops too low and affects subsequent conception rates. - Large amount of supplementary feed required through late pregnancy and calving or provision of irrigated feed source / fodder crop. (Increased cost of production can impact on profit)
Joining May-July Pasture – high quality green feed available after the break of season, but quantity may be low.	- Normally have green feed on offer through joining.	- Reduced BCS possible following calving depending on how well you have met the nutritional demands during autumn. - Risk of lower reproductive rates due to lighter BCS, lower plane of nutrition and shorter daylength during joining. - Heavier target joining weights are likely to be more important to achieve good heifer conception rates. - Potential milk fever and grass tetany risk (short pastures low in magnesium).
Preg Scanning August-September Pasture – generally high-quality and quantity of green feed available.	- Not too busy doing other jobs. Empty cattle can be drafted for sale (feedlot heifers) or finished to sale weights through spring. - Opportunity to re-join heifers for a spring calving or run as dries for meat enterprise. - Good ability to meet cow nutritional requirements for lactation.	- Surplus feed may not be utilised unless running another grazing enterprise or hay/silage production.
Weaning December Pasture – declining quality and quantity of feed available.	- Cows generally in good condition and anything dry at weaning can be sold without the need to carry through summer and autumn. - Weaners can either be sold now or carried through to the following spring. - Older calves (8-10 months) are more robust to carry over summer and autumn than younger calves.	- Potential for cows becoming overfat (BCS>4) due to a potentially lower stocking rate run in this system. - Lower profitability due to lower stocking rates.

Table 3 – Pros and Cons of a winter calving system

WINTER CALVING	PROS	CONS
Calving May-July Pasture – high quality green feed available after the break of season, but quantity may be low.	- Lower amount of supplementary feed required through calving, depending on the timing of the break.	- Potential milk fever and grass tetany risk (short pastures low in magnesium). - Wet and cold conditions with less hours of daylight for checking calving cows. - High likelihood of wet muddy yards during calving and calf marking increasing the likelihood of disease and infections.
Joining August-October Pasture – generally high-quality and quantity of green feed available.	- Lower target joining weights for heifers may be possible due to joining on a rising plane of nutrition (flushing effect). - Ability to meet requirements for heifer conception.	- The effect of high protein pastures on conception rates was raised as a potential issue.
Preg Scanning November-January Pasture – declining quality and quantity of feed available.	- If scan early, still have the potential to re-join dries for a spring calving. - Dries are still in good condition for sale at the end of spring and early summer.	- Need to schedule the time of scanning during a busy time on the farm (marketing cattle and lambs as well as clashes with sheep enterprise animal management).
Weaning January Pasture – generally low-quality dry feed.	- Dry cows are normally still in good condition for marketing and sale. - Calves 5-8 months old by weaning and still reasonable weights to be robust enough to carry over summer and autumn.	- Smaller later-born calves may need supplementary feeding of good quality hay or silage through summer and autumn (higher protein and energy requirements than older calves).

Table 4 – Pros and Cons of a spring calving system

SPRING CALVING	PROS	CONS
Calving August-October Pasture – generally high-quality and quantity of green feed available.	- No supplementary feed required through calving. Abundance of spring feed = less calf abandonment. - Feed requirements met by pasture.	- Increased milk supply can cause udder issues in older cows. - Need to manage pre-calving condition score and late pregnancy nutrition to avoid dystocia issues from excess nutrition. - Calf marking in October may clash with sheep enterprise management calendar (crutching etc).
Joining November-January Pasture – declining quality and quantity of feed available.	- Good body condition score at joining coming out of spring. - Longer daylength resulting in increased conception rates.	- May be difficult to meet requirements for lactation and growth later in the season. - Cows with calves at foot likely to start losing BCS. This is not a problem if it is not affecting conception rate and cows have a high BCS to start with. - First calf heifers may require supplementary feeding if BCS starts to decline below 3.0.
Preg Scanning February-March Pasture – generally low-quality dry feed	- Dry yards	- Cow BCS may be low from lactating over summer. Dry cattle potentially not worth as much if they are lighter and leaner at Pregnancy Scanning. - May have to carry dries through winter and spring to achieve optimum sale condition.
Weaning April-May Pasture – generally low-quality dry feed	- Draw down on cow condition score during summer to provide protein for young calves through the milk. Ability to wean on cow BCS (i.e. wean when BCS <2.5). - Lower amount of supplementary feed required to feed to weaners and dry cows. - Alternatively, ability to increase stocking rate and feed the same amount of supplementary feed to a greater number of animals.	- Need to monitor weaners carefully for worms. - Lack of growth and ability to put on BCS in calves following weaning. - Requirement to supplement weaners with high quality feed up until after the break and potentially through winter to get enough growth to meet target market weights after second spring. - Light young weaners will require a higher quality production diet than older weaners through this period.

Recommendations

With several producers within the group contemplating changing from an autumn to a winter or early spring calving system, the group discussed what considerations producers need to think about before making major changes. The following is a snapshot of this peer-to-peer discussion.

- There may be a requirement to change target market of sale stock (ie Feedlot entry rather than weaners or finished yearling cattle).
- Cash flow could be a problem. If you traditionally sell weaners in December or January, you may not get an income until after the next spring. Solutions to this could involve:
    - Trading to fill gap.
    - Selling out your calving autumn cows and buying in spring calving cows.
    - Keeping the weaners and selling after the first spring (rather than selling as weaners)
- The cost of feed (cents per kg dry matter) may not change, but less volume may be able to be fed to weaners compared to cows.
- High quality protein production feed will be needed to supplement younger weaners over the autumn period.
- Changing to a winter or spring calving system is only beneficial if you increase your stocking rate and pasture utilisation (and hence profitability).
- Consider the soil type and conditions through calving (potential for calves to be born in wet, muddy conditions in September in some areas) and the effect of potential pugging issues on the pasture.
- If in a shorter growing season area, September calving could also be too late, particularly if the season finishes early.
- Consider potential clashes with other operations in the management calendar (especially with mixed enterprises).
- Consider the timing of calving and lactation in relation to animal health conditions such as metabolic conditions (i.e., grass tetany) and worm management.
- Have a good handle on your current reproductive, production and financial performance before making dramatic changes and plan out both the management and financial impact to the business.

Summary and conclusions

Whilst the focus of this project is on optimising reproductive performance, producers will continue to be encouraged to monitor and discuss the impact of management decisions on their cost of production, along with productivity per hectare.

To look at the financial impacts of management decisions, including calving time, a couple of group members will input their own data into an economic calculator that has been developed by The University of Adelaide.

With another year to run, this project will continue to collect reproductive data from the monitor mobs and case studies will be developed. These will be available on the project page for MFMG members at the conclusion of the project.

Through this collaborative model, producers are successfully building their knowledge and skills to assist them to optimally manage their breeding heifers through to second calving with the aim of improving the overall profitability within their beef enterprise.

Acknowledgements

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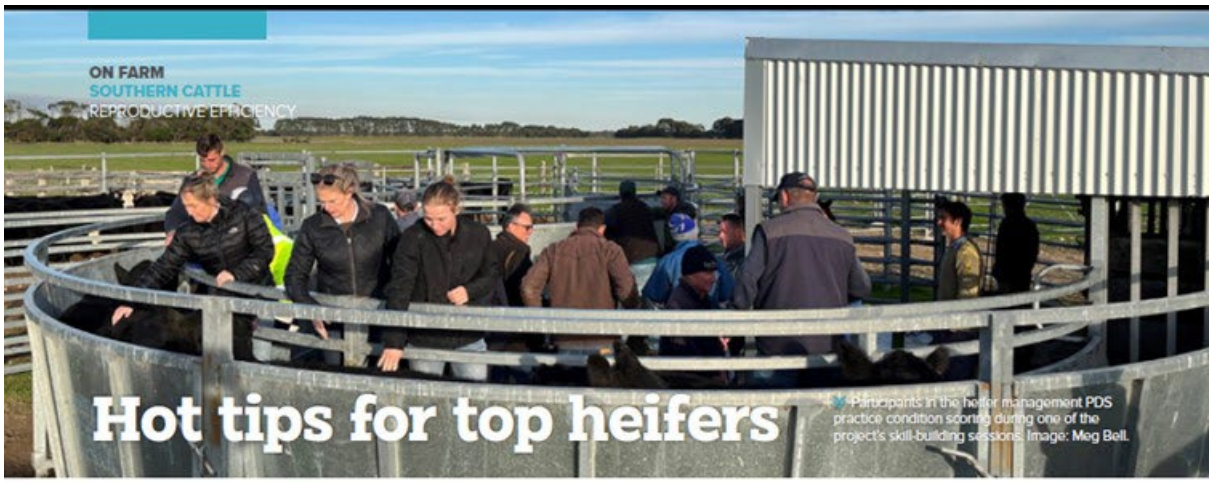
7.1.7 Media articles – MLA Feedback Winter 2023, p34-37



ON FARM
SOUTHERN CATTLE
REPRODUCTIVE EFFICIENCY

Hot tips for top heifers

Participants in the heifer management PDS practice condition scoring during one of the project's skill-building sessions. Image: Meg Bell.

Beef producers in the high rainfall zone of SA's Limestone Coast region are making headway in improving breeder reproduction rates from heifers through to their second calving.

More than 30 producers – representing 19 beef businesses which collectively run 18,000 breeders across 50,000ha – are involved in a three-year, Producer Demonstration Site (PDS) with MacKillop Farm Management Group (MFMG) and the University of Adelaide. (This is a producer co-contributor PDS funded by MLA and MLA Donor Company.).

They're developing and adopting best practice management systems to reduce reproductive losses and boost the health, nutrition, welfare and profitability of their herds.

The PDS involves expert-facilitated peer learning sessions at participants' properties, assisted by a team of researchers, veterinarians and agronomists.

The PDS project facilitator, livestock consultant Elke Hocking, said the on-farm sessions were an important source of peer learning, and drove adoption of more investigative approaches to solve reproductive issues.

"Producers are comfortable discussing the 'good, bad and ugly' and learned a range of skills including body condition scoring, pasture assessment, genetics and bull selection to meet breeding objectives, pregnancy scanning and more," Elke said.

Farm consultant Tim Prance demonstrates pasture testing and assessment to the group. Image: Meg Bell.

Here, Elke shares seven insights from the project.

1 Monitor to measure

Elke's number one tip to improve heifer reproductive outcomes is to monitor and measure from the start – know the mature weight of your adult cows to set realistic target joining and calving weights for heifers.

"Continual monitoring of body condition score and liveweight throughout their reproductive cycle will help inform management decisions and demonstrate whether you're achieving objectives," Elke said.

In 2021, the PDS participants joined a monitor mob of 2020-drop heifers, which calved down in 2022. They collected liveweight and feed on offer measurements at weaning and joining, as well as pregnancy status, animal health and subsequent calving results through to their second calving in 2023. Results will be available for analysis by the end of 2023.

2 Weigh to go

As some producers were not regularly weighing cattle, and many didn't know the reference weight of their adult cows, Elke said this information is important to set realistic targets for joining.

The recommended heifer joining target is 60% of mature cow weight. For example, this will be 330kg for a herd with 550kg mature cows, whereas in a herd with 700kg cows, the target is closer to 420kg.

"Reference weight is best obtained two weeks after mature cows' calves are weaned, preferably at body condition score (BCS) 3," Elke said.

"Each additional BCS is worth about 70–100kg (depending on breed) so you'll need to adjust your reference weight back to what they'd be at BCS 3."

3 Don't overlook pasture

Meeting breeders' nutritional needs requires good skills in pasture assessment and the ability to calculate supplementary feeding rates to meet shortfalls.

It's important to test and measure pasture and feed availability.

"This ensures nutritional requirements are met during pregnancy so you're able to reach growth rate targets," Elke said.

"Poor joining and reproductive rates can be due to a lack of energy in pasture. Know your feed on offer."

4 Get the balance right

Generally, the higher the body weight, the higher the reproduction rate. However, within different calving systems, some pasture and liveweight targets are more critical than others.

"For a late spring joining with a winter calving, liveweight at the start of joining is not as critical due to high growth rates from the increased flush of high quality spring feed available," Elke said.

Table 1: Calving system management calendar. This table represents timelines for three of the most common systems amongst the project participants.

Season	J	F	M	A	M	J	J	A	S	O	N	D
Autumn		Calving			Joining			Preg test				Wean
Winter	Wean				Calving			Joining			Preg test	
Spring		Preg test		Wean				Calving			Joining	

"However, liveweight becomes more critical for autumn calving systems with a May/June joining as there's usually lower pasture availability and low growth rates of livestock during winter months."

5 Focus on fertility

The PDS has been linked into a University of Adelaide project aimed at optimising heifer development and management (see article on right on right).

A key metric within this is 'wet and pregnant early' (WAPE), a measure which describes a heifer successfully getting in calf, raising a calf and getting back in calf within the first six weeks (two cycles) of joining. Once WAPE is achieved, heifers tend to be productive and robust as mature cows.

While pregnancy scanning for wet/dry can be done from six weeks after bull removal until one month prior to calving, fetal aging is a tool that can drive reproductive efficiency to achieve WAPE.

Fetal aging can be done 14–15 weeks from the start of joining and can identify heifers that got pregnant in the first cycle and those who took an additional cycle to conceive.

"Some group members are preferentially retaining these early fertile heifers and either selling the 'lates' or calving them down as a separate mob for easier management during calving," Elke said.

For examples of energy requirements for different livestock classes see Table 1 in the *More Beef from Pastures online manual*.

6 Bulls matter

Fixed-time AI condenses calving and allows heifers more recovery time before second joining. It's a cost-effective way to attain top genetics, however it's labour intensive and still requires back-up bulls to be used.

Producers should check bulls for fertility and reproductive diseases prior to joining.

"There's nothing worse than a dud bull shooting blanks. Once cows are through their second pregnancy, they're pretty bullet proof – any issues are likely due to either the bull or disease," Elke said.

Clear breeding objectives and selecting bulls based on estimated breeding values (EBVs) for desired traits will deliver results. The EBV most closely associated with getting heifers in calf early is Days to Calving.

Scan this QR code to read how another PDS used fixed-time AI to improve heifer productivity.

Putting research into practice

Davies Livestock Research Centre director Professor Wayne Pitchford and PDS project facilitator and consultant Elke Hocking. Image: Meg Bell.

Veterinarian Sean McGrath provided advice on reproductive health issues during the project.

Streamlining the delivery of research outcomes to producers was one of the key factors behind the decision to link this PDS to the University of Adelaide's '*Optimising heifer development and management to increase whole herd productivity*' project.

The project is led by Dr Michelle Hebart and falls under the university's Davies Livestock Research Centre.

"It's two-way, we're getting access to research results hot-off-the-press and simultaneously, producers are informing researchers how they want findings delivered. Having researchers on the ground is truly collaborative – it's one of the most exciting parts of the project," PDS facilitator Elke Hocking said.

Producers are testing a calculator being developed by University of Adelaide's Darren Koopman to determine the economic impact of various reproductive rates and management decisions.

Once finalised, it will help answer whether increasing heifer conception rates to 88–90% will translate into increased profitability. The calculator is due to be released in late 2023.

> **"Having researchers on the ground is truly collaborative – it's one of the most exciting parts of the project."**

Veterinarian Dr Sean McGrath has been instrumental in investigating how animal health, husbandry and welfare issues impact reproductive performance. At each session he's answered producers' animal health questions around monitoring and testing for worms, trace elements and reproductive diseases, bull testing, managing dystocia and 'when to call the vet'.

Sean oversaw calf post-mortems to identify causes of death and advocates for an investigative approach in preventing problems. Producers have increasingly sought more accurate diagnostic procedures – with access to project funding for blood testing and Sean's expertise invaluable.

Sean identified intestinal worms and trace element deficiencies (copper, cobalt and selenium – common in many southern Australian regions) as the main health issues impacting reproduction efficiency – the main effect being heifers not reaching target weights. He advises proactive testing and supplementation for any deficiencies and watching egg counts in young stock post weaning after the autumn break. Well-timed use of treatments will keep stock on track.

"Preventative plans and using strategic control points such as summer drenching or appropriately timed trace element supplementation, can ensure heifers are getting to target weights for joining and calving," Sean said.

7 Combat dystocia

Rethinking how to combat dystocia, a common cause of reproductive loss, led the PDS group to some new genetic insights.

"No-one wants to pull calves – it's hard work and a significant factor in cow and calf mortality," Elke said.

"For many producers, selecting for shorter gestation and calving ease EBVs has been key to reducing dystocia in heifers, along with low to moderate birth weights.

"Limiting feed in heifers prior to calving to reduce birth weights to help prevent dystocia can backfire with heifers lacking energy to push calves out.

"Heifers need adequate nutrition throughout late pregnancy to sustain their growth rates and milk production, in addition to growth of the fetus," Elke said.

It's equally important that heifers grow well prior to joining and in the first half of pregnancy.

This means they don't have to catch up during the second half of their pregnancy when there's the risk of nutrition increasing calf size.

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Four ways to target heifer productivity

1. To achieve 85% conception rate in six-week heifer joinings, aim for pre-joining liveweights of 60% of mature cow weight.
2. To optimise re-conception, the target liveweight for heifers leading into their first calving is 85–90% of the mature cow reference weight. BCS of 3 and high quality feed on offer will also contribute to re-conception success.
3. Heifers are still growing so they have specific nutritional requirements – measure feed availability accordingly. Keep them on track to reach growth-rate targets before joining.
4. Test and measure rather than guess – blood tests will identify any mineral deficiencies or animal health issues.

SEASONAL ACTION PLAN

- Shore up your feedbase to provide optimal nutrition for reproductive success: **mla.com.au/feedbase-hub**
- Upskill in heifer nutrition for reproductive success at a Heifers for Profit PGS workshop: **rist.edu.au/heifers-for-profit**
- Develop an annual health plan with your vet. Scan this QR code to see ParaBoss's worm control calendar or visit **paraboss.com.au**

TO DO

- Access Producer Demonstration Site (PDS) resources – including the e-news, the PDS search tool and how to get involved: **mla.com.au/pds**
- Understand estimated breeding values (EBVs): **genetics.mla.com.au/temperate**
- Scan this QR code to read how another project participant has improved reproductive efficiency at 'South Killanoola' in the summer 2022 edition of *Feedback*, page 28.
- Listen to a podcast on this project: (season 2, episode 2); **mackilliopgroup.com.au/the-prosperous-farmer**
- Visit MLA's new grazing land management hub: **mla.com.au/grazing**

Scan the QR code to learn more about this PDS.

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Robust herd benefits from new insights

Darcy Bateman and his father Chris have a tried and tested approach which achieves strong fertility and productivity outcomes in their south-east SA mixed enterprise – but they're open to new ideas.

Their involvement in a local Producer Demonstration Site (PDS) project looking at reproductive health and management practices for beef heifers (see story page 34), informed some potentially profitable tweaks to their breeding strategy.

PDS a timely refresher

Darcy, who recently returned home after almost a decade studying and working as a project manager in the construction industry, was keen to join the PDS to brush up on his skills.

He said hearing from other producers about their different management styles and production systems was valuable.

"We also had access to a range of presenters who spoke about economic modelling of different herd compositions and reproductive and metabolic diseases," Darcy said.

For example, veterinarian Sean McGrath facilitated animal health testing to investigate possible contributors to some animal health issues in their herd – blood tests taken from heifers with lower condition scores revealed markers pointing to kidney damage resulting from plant toxicity.

"We gave the heifers a drench and improved their nutrition – we moved them to a paddock with more food on offer which was of better quality," Darcy said.

Breeding strategy

The Batemans run a self-replacing herd of Hereford/Simmental-cross and Angus/Black Simmental cows. They use Angus bulls in the top 30% for the Calving Ease estimated breeding value (EBV) over heifers, while Hereford and Simmental bulls are used over mature breeders.

Their established crossbreeding approach to derive hybrid vigour (heterosis) has yielded strong results, with progeny exhibiting greater size, growth rates and fertility than their parents.

"It's interesting to see bull EBVs translate into our bullock carcase data – our Simmental-cross bullocks consistently achieve higher Eye Muscle Area (EMA) values, while our Hereford-cross and Black Simmental-

Darcy Bateman and his Hereford-cross heifers with their first calf at foot by an Angus bull. Image: Darcy Bateman

Angus bullocks achieve better marbling scores," Darcy said.

The Batemans grow bullocks out to target 340kg dressed weight to meet Grasslands/PCAS specifications at 18–21 months. One of their bullocks recently won reserve grand champion carcase at the annual Southern Grassfed Carcase Classic at Lucindale.

Stringent standards

The Batemans wean in December.

Heifer weaners are generally run on perennial pastures and receive supplementation (such as ryegrass/clover hay) through autumn until after mating.

Heifers are joined at 14–15 months, and the Batemans' management has resulted in a long-term average pregnancy tested in calf (PTIC) rate of 85%.

"We pay stringent attention to any structural or temperament issues and meticulously cull heifers after preg-testing if they don't meet required standards," Darcy said.

Trialling new management

Previously, they used a six-week joining. However, Darcy aims to adjust his joining schedule this year – moving to a split joining of four weeks, with a one to two-week break followed by another three-week joining – resulting in two calving periods.

"Our mob sizes vary a bit at joining, but bulls are generally run at approximately 3–4% in cows and 2.5–3% in heifers. The ratio will remain unchanged at this stage.

"We trialled this in 2022 in a different mob sold as PTIC every year and found that 65% of retained heifers from the second joining had calved within the first week of the due date.

"Providing we get a favourable preg-scanning result, we'll retain as many heifers in the first calving cycle as possible to tighten up the spread in calf phenotypes as they're marketed," Darcy said.

Rethinking EBVs

Throughout the PDS, Darcy has followed a 'monitor mob' of heifers, from weaning age to turning off their second calf. Body condition score (BCS) and weight were recorded during different periods to determine what relationship exists between BCS and conception rates.

"It's been interesting reviewing scanning results and identifying their relationship to BCS and percentage of mature cow weight (MCW) at joining," Darcy said.

The PDS learnings have seen Darcy branch out from initially prioritising Calving Ease and Scrotal Size EBVs when considering fertility in bulls. He now also considers Days to Calving – rather than lower birth weights – to ensure calves' eventual size at maturity is not compromised.

He's also drawing on the data generated by the PDS to investigate the heritability of conception rates, particularly out of leaner-type bulls. ■

> **"We pay stringent attention to any structural or temperament issues and meticulously cull heifers after preg-testing if they don't meet required standards."**

SNAPSHOT

DARCY AND CHRIS BATEMAN, 'Cheverton', Furner, SA

AREA
1,400ha

ENTERPRISE
500 Hereford/Simmental-cross cows and Angus/Black Simmental cows

PASTURES
Perennial pastures (phalaris, subclover and strawberry clover base)

SOIL
Grey sand over clay, black cracking clay

RAINFALL
670mm

LESSONS LEARNT

- Continually monitor heifers to meet their nutritional requirements throughout their reproductive cycle.
- Key profit drivers correlate to different management tools, such as managing stocking rate throughout the year, timely preg-testing and selecting bulls for required genetics.
- Peer-to-peer discussions enabled sharing of experiences around what worked and what didn't work in each other's businesses.

ENTERPRISE CALENDAR

- **Joining:** Bulls in with heifers 5 May 2023.
- **Pregnancy scanning:** This varies depending on season – however scanning will occur at six weeks after bulls come out (differs when fetal aging is required).
- **Condition scoring:** Continuous monitoring at every handling in yards and in paddock.
- **Calving:** 15 February 2024 for six weeks.
- **Weaning:** Mid-December 2024 (subject to seasonal conditions).

Producer Demonstration Site (PDS) news, resources and to get involved: **mla.com.au/pds** Genetics hub: **genetics.mla.com.au**
Shore up your feedbase: **mla.com.au/feedbase-hub** Darcy Bateman **darcy.bateman@gmail.com** Alana McEwan **amcewan@mla.com.au**

7.1.8 Media articles – MFMG Trial results book 2023, Ch 9: p66-73

Chapter 9.
Collaboration key to improved heifer management and reproductive success

Project Code: P.PSH.1280
Project Title: Reproductive health and management practices in beef heifers

Authors: Elke Hocking[1] and Ashley Carslake-Hunt[2] *(elkehocking@gmail.com)*
[1] Elke Hocking Consulting
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KEY MESSAGES

- This collaborative project between producers, researchers, veterinarians and; livestock advisers involved peer-to-peer learning which has enabled a supportive environment for on-farm adoption to occur.
- Measure the standard reference weight (SRW) of your breeding cows (measured two weeks after the mature cow has weaned her calf at BCS 3.0) to set realistic targets for joining weights. Understand that each Body Condition Score (BCS) is worth around 70-100kg in liveweight (depending on breed) and adjust accordingly.
- To improve conception rates, proactively manage weaner heifers to achieve critical mating weight targets and condition scores prior to joining (60% of SRW prior to heifer joining and 85-90% of SRW prior to second joining).
- 'WAPE' (wet and pregnant early) is defined as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of their second joining. Once WAPE is achieved, mature cows continue on to be robust and productive.
- Producers within this project increased the percentage of heifers achieving 'WAPE' from 48% and 57% in baseline levels (2018 and 2019 drops) to 62% in the monitor mob (2020 drop) and are well placed to achieve 70% in the 2021 drop heifers.

Background

This co-contributor Producer Demonstration site project P. PSH.1280, *"Reproductive health and management practices in beef heifers"* was funded by Meat & Livestock Australia (MLA) and the MLA Donor Company, along with producer contributions, and ran from December 2020 to December 2023.

The project aimed to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving. It was set up to link in with the University of Adelaide's MLA funded research and development project B. GPB.0038, *'Optimising heifer development and management to increase whole herd productivity,'* to achieve a faster rate of on-farm adoption of scientific research.

Within the three-year project, 19 participating beef businesses, representing around 18,600 breeding cows across 49,000 ha of farmland within the Limestone Coast region of South Australia, were encouraged to monitor their 2020 drop heifers in relation to liveweight, BCS, animal health and reproductive rates from weaning through to second calving in 2023. Over the three-year period, twelve interactive, technical sessions were conducted across eleven host properties from within the group.

66

Activities

Ten producers within the group (representing 5,330 breeding cows) submitted mob-based data on the liveweights, BCS and reproduction of their 2020 drop heifers (R-purple tag), joined in 2021 to calve as heifers in 2022 and as second calvers in 2023. Where possible, they also submitted baseline data from 2018 (P-orange tag) and 2019 (Q-green tag) drop heifers, and also subsequent data from 2021 drop heifers (S-yellow tag).

The group met in person a total of 12 times over the course of the project and visited 11 host properties from within the group. At each session, producers practiced body condition scoring and pasture assessment, along with discussing the nutritional requirements of the different classes of cattle within the group in relation to seasonal conditions.

With a strong emphasis on peer-to-peer learning (as well as support from a team of technical experts, livestock consultants, veterinarians, and industry representatives) technical sessions included: understanding genetics and bull selection to meet a breeding objective; hybrid vigour; metabolic and animal health conditions; bull structure and fertility assessment; tips for assisting difficult calving; calf post-morterms; treatment of calf scours; logistics of artificial insemination (AI); pregnancy scanning and foetal aging; discussions of calving times and management systems within the group; understanding the profit drivers of the beef enterprise; partial budgeting; and marketing.

Over the course of the project, an additional 90 people have been engaged in the project through attendance at wider engagement events of the Mackillop Farm Management Group (MFMG) livestock field days. Of these extras, 76 were producers and the remaining 14 were a mixture of livestock advisers, industry professionals, veterinarians, or researchers.

Table 1 shows the reproductive calendar for the three most common calving systems amongst the project participants. Table 2 shows the spread of calving systems within the submitted data. Autumn calving = February to April, Winter calving = May to July, Spring calving = August to October.

Table 1: Calving system management calendar.

Season	J	F	M	A	M	J	J	A	S	O	N	D
AUTUMN		CALVING			JOINING			PREG TEST				WEAN
WINTER	WEAN				CALVING			JOINING			PREG TEST	
SPRING		PREG TEST		WEAN				CALVING			JOINING	

Table 2: Farm data collection matrix. Calving time: A=autumn, W=winter, S=spring.

	FARM 1 (A)	FARM 2 (W)	FARM 5 (W)	FARM 6 (W)	FARM 7 (A)	FARM 8 (S)	FARM 9 (S)	FARM 10 (S)	FARM 11 (A)	FARM 12 (A)
Monitor mob data	√√	√√	√√	√	√√	√√	√√	√√	√√	√

√=monitor mob data and baseline data, √√=monitor mob data plus 2021 drop heifer data.

Results & Discussion

The following tables show the combined data from the 12 producers who submitted baseline data along with monitor mob data and subsequent 2021 heifer reproduction data. Table 3 shows that producers have increased the liveweights of heifers at joining from 52% of the standard reference weight (SRW) of mature cows, in 2017 drop heifers, to 58% in 2021 drop heifers. This is closer to the recommended target of 60% to achieve 85% conception rates in a six-week joining. Conception rates for heifers for the monitor mob was 81%, with a moderate increase to 84% in the 2021 drop heifers, which meets the standard for good heifer conception rates.

It is important to note that the monitor mob heifer conception rates were 80%, 79% and 86% for autumn, winter, and spring calving systems respectively, and that subsequent conception rates for 2021 drop heifers were 85%, 80% and 86% respectively for autumn, winter, and spring calving systems. This indicates that the autumn calving systems may have benefited the most from better meeting target joining weights, whilst the winter and spring systems remained relatively stable. This agrees with the linked R&D project recommendation that liveweight at the start of joining is more critical for autumn calving systems, due to having lower pasture availability and low growth rates of livestock during joining through winter. The spring calving systems within this project achieved the best heifer conception rates, however also had the highest levels of heifers needing assistance at calving, although preventative management meant there was very low mortality rates. The rates of assistance and mortality rates through calving was further reduced by the end of the project.

Table 3: Summary combined producer heifer data (2017 to 2021 drop heifers).

Year of drop	Joining year (join length)	Av. lwt 1st joining	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2017 (N)	2018	342 kg	52%	83%	2019	73%	13%	2.7%	82%
2018 (P)	2019	349 kg	53%	76%	2020	93%	6.4%	1.3%	68%
2019 (Q)	2020	353 kg	53%	80%	2021	90%	6.6%	0.4%	59%
2020 (R)	2021	372 kg BCS 3.3	56%	81%	2022	93%	8%	0.8%	67%
2021 (S)	2022	380 kg	58%	84%	2023	94%	4%	0.6%	74%

To optimise re-conception, the target liveweight for heifers leading into their second calving is 85% to 90% of the SRW. A BCS of 3 and high-quality feed on offer will also contribute to re-conception success. Within this dataset, Table 4 shows there was a slight increase from 80% of SRW, in 2017 drop heifers, to 85% in 2019 and 2020 drop cows.

Despite most producers saying that they wanted to lift conception rates in second calving cows at the initial planning meeting in December 2020, baseline data indicates that re-conception rates were already quite good at 88%, with weaning percent to cows joined around 82 to 85%. This is potentially due to the fact that these animals get preferential treatment and are often allocated the best feed in the lead-up to the second joining. Within this project, the monitor mob re-conception rates were further increased by 4% to 92%, resulting in 89% weaning rate to cows joined (Table 4).

Table 4: Summary combined producer second calving data (2017 to 2020 drop heifers).

Year of drop	Joining year (join length)	Av. lwt 1st joining	% SRW	Heifer conception %	Calving month & year	% calves born alive to cows calved	% assisted at calving	Heifer mortality %	Weaning % (to joined)
2017 (N)	2019	518 kg	80%	88%	2020	96%	1%	1.3%	82%
2018 (P)	2020	534 kg	82%	88%	2021	94%	1%	0.5%	85%
2019 (Q)	2021	550 kg	85%	88%	2022	98%	0.7%	0%	85%
2020 (R)	2022	523 kg	85%	92%	2023	98%	0%	0.6%	89%

Across all of the producer data, the percentage of calves born alive to cows pregnancy tested in calf (PTIC) and calved down was fairly stable around 94% for heifers and 94% to 98% in second calvers. The amount of assistance for cases of dystocia (difficulty calving) was reduced from 13%, in 2017 drop heifers, to 4% in 2021 drop heifers, with subsequent heifer mortality reduced from 2.7% down to 0.6%. For many producers, selecting bulls for shorter gestation and calving ease EBVs has been the key to reducing dystocia in heifers, along with low to moderate birth weights. Cow mortality in second calving cows also reduced slightly from 0.2% to 0%.

One of the learnings throughout the project was dispelling the myth that limiting feed in heifers prior to calving will reduce birth weights to help prevent dystocia. Peer-to-peer discussions, along with technical presentations indicated that this strategy can often backfire, with heifers lacking energy to push calves out. Heifers need adequate nutrition throughout late pregnancy to sustain their growth rates and milk production, in addition to foetal growth. It's equally important that heifers grow well prior to joining and in the first half of pregnancy, rather than trying to 'catch-up' during the second half of pregnancy, when there's a bigger risk of nutrition increasing calf size.

Another important lesson for producers was that many got a shock after weighing their mature cows and finding their mature cow standard reference weights were a lot higher than expected, which meant the target weights they were using for joining were inaccurate. According to the linked heifer R&D project, SRW is best obtained two weeks after mature cows' calves are weaned, preferably at BCS 3. Each additional BCS is worth about 70–100 kg (depending on breed) so if they are fatter or leaner than BCS 3, the weight can be adjusted accordingly. The average reference weight for the group was around 650 kg on average, with some breeds closer to 700 kg (particularly those utilising hybrid vigour from European breeds such as Simmental).

The linked heifer reproduction R&D project describes 'WAPE' as a heifer successfully getting in calf, raising a calf, and getting back in calf within the first six weeks (two cycles) of their second joining. Within this project, WAPE has been assessed from joining through to second calving. The following figures (Figures 1-4) show the decline in the percentage of heifers (from 100% at joining for each drop) through to the percentage of animals still remaining in the herd to be joined for a third time after their second calving. The results demonstrate an increase in WAPE from 48% and 57% in baseline levels (2018 and 2019 drops) to 62% in the monitor mob (2020 drop). This is likely to increase further in the subsequent 2021 drop mob, with a 7% increase already seen in the percentage of heifers that managed to conceive for a second time. Very few losses occur after this stage, suggesting that WAPE will be closer to 70% for the 2021 heifer drop within the group.

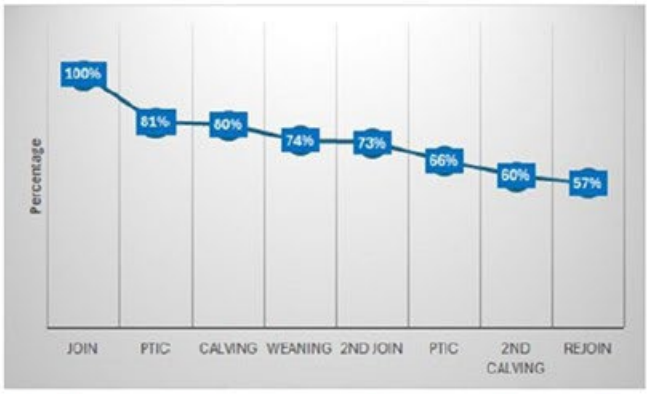

Figure 1: Beef PDS combined producer data showing the percentage of 2018 drop (P-orange tag) heifers in the herd from first joining (100%) through to rejoining after their second calving.

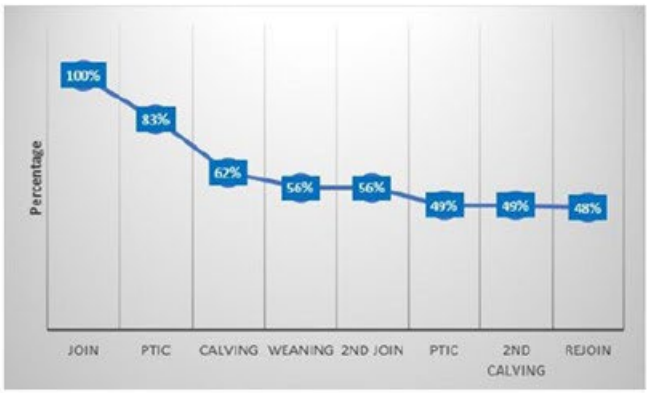

Figure 2: Beef PDS combined producer data showing the percentage of 2019 drop (Q-green tag) heifers in the herd from first joining (100%) through to rejoining after their second calving.

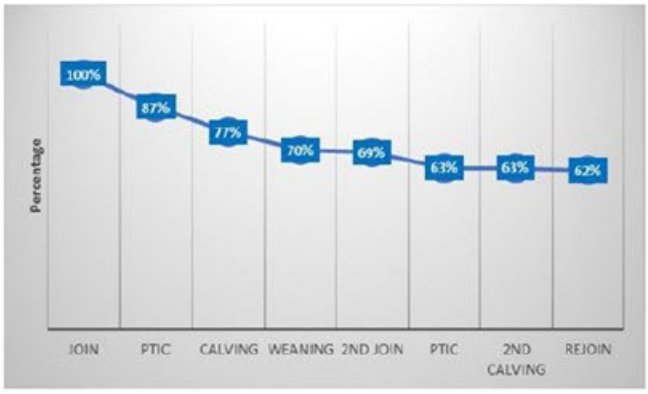

Figure 2: Beef PDS combined producer data showing the percentage of 2020 drop (R-purple tag monitor) heifers in the herd from first joining (100%) through to rejoining after their second calving.

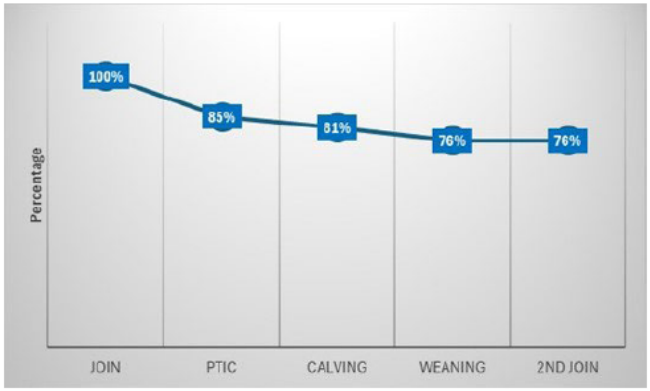

Figure 4: Beef PDS combined producer data showing the percentage of 2018 drop (P-orange tag) heifers in the herd from first joining (100%) through to rejoining after their second calving.

Another interesting result from the project, was that one producer calved down their Q-drop (2019) heifers between the 11th of July and the 23rd of August 2021, then re-joined immediately following calving on the 27th of August to the 8th of October (after the last calf was dropped) and effectively brought the mob back to a June calving, whilst still achieving 92% re-conception rates. This success can be explained due to the high quality and quantity of feed on offer during joining, cows being at their recommended 80% of their standard reference weight and of high BCS (BCS>3.5).

Figure 5 shows that cows can return to first cycle post calving as early as 31 days if they are in good condition and achieve 90% re-conception rates if high feed is on offer. In this case, the mid-point of calving was around the 25th of July, meaning that when the bull went in, they would have been around 33 days post calving. This is useful information to know what can be achieved if calving time ever needs to be brought back for other management reasons.

	Feed availability*	Condition score at calving		
		1.5 - 2.0	2.5 - 3.0	3.5 - 4.0
Days to return to first cycle post calving	high feed	49	38	31
	low feed	65	45	38
Pregnancy rate	high feed	84	92	90
	low feed	70	87	86

Source: ReproActiv, Zoetis

Figure 5: Effect of nutrition post-calving and condition scores of cows at calving on cow reproductive performance.

Key management practices adopted

With a strong emphasis on industry collaboration and interaction between researchers, veterinarians, livestock advisers and peer-to-peer learning, producers within the group increased their knowledge by 19% (from 65% to 78%) and increased their skills and confidence for managing their breeding herd for improved health and reproduction by 13% from 65% to 78%.

As a result of participating in this project, the percentage of producers who have adopted (or intend to adopt) the following management practices were:

- 100% will record herd performance data annually (number of calves weaned to cows joined).
- 100% will pregnancy scan.
- 100% will have a breeding objective and use EBV's when selecting bulls.
- 89% will manage the herd for a 6-9 week joining.
- 84% will assess BCS at key points in the reproduction cycle and record mortality rates and cause of death in the herd.
- 84% will calculate the production efficiency of their herd (kg beef produced per hectare) and calculate their beef cost of production ($/kg liveweight).
- 74% will record pasture quantity and quality throughout the year, whilst a further 11% use practical experience to assess pasture rather than measurement.
- 69% will have a documented yearly animal health plan for their herd, whilst a further 10% have a yearly plan (it's just not written down).
- 68% will record foetal age and split into 'earlies and lates' when pregnancy scanning.
- 53% will keep individual records on reproductive performance.

Of those who said they wouldn't adopt the practice of keeping individual records:

- 10.5% said that all animals are pregnancy tested and managed as a mob. Each cow must get pregnant and raise a calf otherwise they will get culled.
- 36.5% said it was too time consuming and that it was either not a significant issue on their property, they couldn't see a benefit or were unsure whether it was worthwhile.
- Interestingly, many producers did record individual weights, but very few were able to download the data, and only average weights were recorded for monitoring purposes.

Practices that have had the biggest impact and lessons learned

- Measurement of the standard reference weight (SRW) of their mature cows within their herd (measured two weeks after the mature cow has weaned her calf at BCS 3.0) to set realistic targets for joining weights. Also understanding that each BCS is worth around 70-100 kg in liveweight (depending on breed).
- Proactively managing weaner heifers to achieve critical mating weight targets and condition scores prior to joining (60% of SRW prior to heifer joining and 85-90% of SRW prior to second joining).
- Monitoring BCS throughout the reproductive cycle,
- Understanding nutritional requirements at different stages of the reproductive cycle,
- Supplementary feeding to meet nutritional requirements if there is a deficit,
- Never keeping a heifer that fails to get pregnant or a cow that fails to rear a calf,
- Fertility testing bulls prior to joining alleviates poor reproductive performance and 'surprises' at pregnancy testing,
- BREEDPLAN is an integral part of choosing bulls and making genetic gains. Selecting bulls based on the "days to calving" (DTC) EBV will have the biggest impact on increasing 'WAPE', whilst selection for calving ease, lower gestation and moderate birth weights will reduce dystocia.
- Pregnancy testing six weeks following bull removal and foetal aging allows for early identification of dries for marketing and allocation of feed to better match nutritional requirements.
- Foetal aging to identify and preferentially retaining heifers conceiving in the first cycle.
- Foetal aging to split into 'earlies' and 'lates' to manage mobs separately according to nutritional and animal health requirements pre- and post-calving, as well as reducing the amount of time spent checking calving cows due to a tighter calving period.
- Developing a whole of herd and whole of lifetime animal health program.
- Accessing credible information from veterinarians and consultants to assess the cost-benefit of animal health treatments within your own business.
- Crossbreeding capitalises on hybrid vigour, where offspring exhibit superior genetic traits and overall robustness compared to their parents, including increased growth rates and improved maternal traits.
- Having a greater proportion of mature cows within the herd will enable better fertility overall, with mature cows achieving 95% conception rates. Understand your herd structure to determine heifer replacement requirements.
- Being involved within a group enables peer-to-peer discussions which challenge your current thought processes around management decisions and motivates you to look closely at what changes are practical within your business and what can improve your productivity and profitability.
- Discussions with other producers are valuable to realise you aren't the only one who makes mistakes and to see what management practices are working and what's not.
- Changing your management practices, in particular your calving time, has implications throughout the rest of the production system. Recognise the need for assistance from consultants, veterinarians and other producers who have experience in the system you are moving to.
- Get your priorities right within your business. Select the things that will give you the biggest bang for your buck and have the biggest impact on your business. Once these things are sorted, then identify what other opportunities there are to improve productivity and profitability.

Out of the core producer group who submitted mob-based data, four businesses were autumn calvers, three winter calvers and three spring calvers. Whilst the different calving times made collection and analysis of data problematic, it was this diversity that drove robust discussions within the group and allowed participants to hear real world examples at the same time as receiving technical and research information. It was also evident to the consultants and researchers, that there needs to be specific extension messaging targeted towards the different calving systems.

For example, generally, the higher the body weight, the higher the reproduction rate. However, within different calving systems, some pasture and liveweight targets are more critical than others. For a late spring joining with a winter calving, liveweight at the start of joining is not as critical due to high growth rates from the increased flush of high-quality spring feed available. However, liveweight becomes more critical for autumn calving systems with a May/June joining as there's usually lower pasture availability and low growth rates of livestock during winter months.

With several producers within the group contemplating changing from an autumn to a winter or early spring calving system, the group discussions around calving time were valuable in determining what considerations producers need to think about before making major changes.

Conclusions

Considerable progress was made in assisting producers build their knowledge and skills to meet the nutritional requirements of their breeding females to achieve optimum reproductive performance and set up for subsequent joinings.

The collaborative model between research, industry and advisors within this project has demonstrated to participants the value of ongoing animal health, nutrition, and pasture agronomy advice with several taking the opportunity to work with livestock consultants and veterinarians one-on-one, outside the formal group setting.

Benefits to the wider Southern beef industry have included the development of extension articles, producer case studies, podcasts, and videos. This group will continue to provide a platform for R&D producer consultation and extension, as well as providing mentoring opportunities for early career livestock consultants for a further three years as a dedicated beef discussion group.

Extension & Communications

REPRODUCTIVE HEALTH AND MANAGEMENT PRACTICES FOR BEEF HEIFERS

PODCAST: THE PROSPEROUS FARMER

MFMG: FEATURED VIDEOS

Acknowledgements

Funding bodies
This co-contributor Producer Demonstration Site (PDS) project is funded by Meat & Livestock Australia and the MLA Donor Company along with producer contributions and ran from December 2020 to December 2023.

Delivery partners and collaborators
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Other supporters (not delivery partners or project collaborators)
Thanks to the 19 participating beef businesses within the Limestone Coast region who have been monitoring the liveweights, body condition scores and reproductive rates for their 2020 drop heifers from weaning through to their second calving in 2023. Thanks, must also go to Emma Peters (MLA graduate intern with The University of Adelaide 2020 -2021) for conducting the initial producer interviews that initiated this project and her work in getting the project up and running.

Photo 1: Producers within the Beef PDS practiced body condition scoring and pasture assessment at every host producer session throughout the three-year project.

Photo 2: Technical deliverers involved throughout the trial included (from left to right): Sean McGrath (Millicent Veterinary Clinic), Ashlee Carslake-Hunt (Tailored Livestock Consulting) and Tim Prance (T. Prance Consulting).

Photo 3: Elke Hocking (Elke Hocking Consulting) conducted interactive producer discussions at every session which were valued highly by participants. Above right: Wayne Pitchford (The University of Adelaide) and Elke Hocking worked collaboratively to link the Heifer reproduction research project with this producer adoption project.

7.1.9 Media articles – MFMG Trial results book 2023, Ch 10: p75-80

Chapter 10.

Implementation of preventative animal health plan to increase reproductive success and reduce mortality rates in heifers

Project Code: P.PSH.1280
Project Title: Reproductive health and management practices in beef heifers

Authors: Sean McGrath[1] and Elke Hocking[2] *(elkehocking@gmail.com)*
[1] Millicent Veterinary Clinic
[2] Elke Hocking Consulting

KEY MESSAGES

- Working with your local veterinarian to develop an annual preventative animal health plan can assist in achieving optimum growth and reproduction rates within your beef enterprise.
- Having cost-effective preventative animal health plans in place, such as worm monitoring and control, mineral and trace elements supplementation and infectious disease monitoring or vaccination, can all contribute to good reproductive performance and lower mortality rates.
- Animals that are healthy and are provided with adequate nutrition to meet their requirements coming into joining, will enable heifers to achieve critical joining liveweights and body condition scores, resulting in higher conception rates.
- In conjunction with preventative animal health, it is important to understand the nutritional requirements of animals during their reproductive cycle, as often investigations of ill-thrift are a result of poor nutrition, rather than specific animal health issues.

Background

The animal health investigations reported in this case study were done on four of the producer properties involved in the Reproductive Health and Management Practices for Beef Heifers Producer Demonstration Site (PDS) project, run by the Mackillop Farm Management Group (MFMG) and co-funded by MLA and the MLA Donor Company with producer contributions.

A group of 19 participating beef businesses, representing around 18,000 breeding cows across 50,000 ha of farmland within the Limestone Coast region have been monitoring the liveweights and body condition scores of their 2020 drop heifers, joined in 2021 to calve in 2022.

The project aims to quantify and reduce the reproductive wastage that occurs from first time heifer joining through to second calving. Whilst a lot of emphasis has been on pasture assessment, body condition scoring and meeting nutritional requirements throughout pregnancy and lactation, participants were also encouraged to investigate any herd health issues throughout the project, such as significant worm burdens or possible reproductive diseases.

Local veterinarian Sean McGrath, Millicent Veterinary Clinic, attended every session throughout the life of the project to address questions around seasonal animal health issues, as well as presenting technical sessions on a wide range of topics throughout the project, including management and treatment of calf scours, dystocia, worms, reproductive and metabolic diseases, bull fertility testing, pregnancy scanning and Artificial Insemination (AI). As a result of an increase in the awareness of the complexity of some of the metabolic and animal health issues within the region, some of the producers within the group have started using Sean and other veterinarians to assist them develop yearly animal health programs for their livestock enterprises.

Activities

Sean worked with four producers with identified animal health issues within their monitor mobs and assisted with recommendations for treatment. The majority of testing was done in response to an identified problem from the farmers involved and was generally a problem of weight loss or ill thrift within different heifer groups.

Interestingly, all the investigations were done at different periods of the heifer reproduction cycle, but all of equal importance. Investigations in the different groups were done at pre-joining for the first time, pre-calving for the first time and post-calving or pre-joining for the second time. It is relevant that the animals within the investigations were all in low body weight at these critical time points, where low body weight has the potential to affect reproductive performance.

Investigations were done on Farm 1, 2 and 3 and included blood and faeces collected for testing for liver and kidney markers, trace elements and worm burden markers, as well as testing for infectious diseases. The final investigation on Farm 4 was focussed on a specific disease, Bovine Viral Diarrhoea (BVD) also known as Pestivirus, and a risk assessment for heifers leading into their first joining. A decision on whether to vaccinate for that disease pre-joining to mitigate the risk of reduced reproductive performance could then be made based on test results.

Farm 2 also used the MLA health cost benefit calculator to determine the cost-effectiveness of preventative management for Grass Tetany.

To assist in reading the results the following definitions and information on some of the tests that were performed may be useful. Normal reference ranges will be provided in each results table.

Trace Elements and Liver or Kidney Biochemistry

- Glutathione peroxidase (GSH Px) is a marker for selenium.
- Copper – measure of copper levels.
- Vitamin B12 – is a marker for cobalt.
- Liver and kidney markers are identified as a group of biochemistry markers urea, creatine, and phosphate.
- For all markers below the reference range indicates a deficiency, within the ranges indicate adequate levels and above the range indicates excess.

Pestivirus (BVD) and Leptospirosis Serology

These are reported as either positive or negative. Positive results mean the animal has been exposed to the virus or bacteria and mounted an immune response. They are sometimes reported as titres, which gives a context of time since exposure, or the level of antibodies present.

Worm burden markers

Ostertagia is the main worm of production significance in cattle, however faecal worm-egg monitoring is unreliable in cattle over 18 months of age. Pepsinogen is the marker for abomasum damage, which is where Ostertagia worms reside and cause damage. Blood test results above the reference range of pepsinogen indicate abomasal damage and a significant worm burden. Higher results indicate more damage and higher worm burden.

Results & Discussion

Farm 1

Five to six heifers within the monitor mob were identified as having severe weight loss compared to the rest of the mob, at the pre-joining period in May 2021. There was a history of access to the plant Lesser loosestrife *(Lythrum hyssopifolia)*, which is known to be toxic to animals. Bloods and faeces were collected for testing for liver and kidney markers, trace elements and worm burden markers.

Table 1: Results of blood tests for kidney biochemistry markers (Farm 1).

Biochemical Marker	Normal range	Animal 1	Animal 2	Animal 3	Animal 4	Animal 5
UREA	2.1-10.7 mmol/L	8.8	42.5 (H)	22.1 (H)	34.7 (H)	37.5 (H)
CREATINE	0-186 umol/L	159	702 (H)	326 (H)	664 (H)	508 (H)
PHOSPHATE	0.80-2.80 mmol/L	3.24 (H)	3.76 (H)	2.31	2.86 (H)	2.94 (H)

H = high levels.

Table 2: Results of blood tests for trace elements and worms (Farm 1).

Biochemical Marker	Normal range	Animal 1	Animal 2	Animal 3	Animal 4	Animal 5
Glutathione Peroxidase GSH Px (Selenium Marker)	40-300 U/gHB	244	233	197	203	149
Copper	7.5-16 umol/L	15.4	9.1	9.5	14.2	8.3
Vit. B12	200-500 pmol/L	327	997 (H)	402	463	602 (H)
Pepsinogen (Indicative of worms)	0.0-5.0 U/L	8.7 (H)	11.8 (H)	11.8 (H)	14.3 (H)	17.2 (H)

H = high levels.

The biochemistry markers for kidney function were all high, which indicates some excessive kidney damage. This is consistent with toxicity from the Lesser loosestrife plant and ingestion of that plant. The trace elements levels were adequate in these animals. The pepsinogen marker that indicates the worm burden was high in all animals, which indicates a significant worm burden.

The cause of ill thrift in these heifers was a combination of kidney damage due to toxicity from the Lesser loosestrife ingestion and a moderate burden of Ostertagia worms. This was likely to have had a negative impact on heifer fertility, with 72% conception rates achieved.

The recommendation for managing the ill thrift in this case was to drench the mob of heifers. Due to the toxic nature of the kidney insult, there was little that could be done for that part of the problem, except to ensure general nutrition was good and trace element and worm burdens were controlled. In future, trying to prevent access to the weed is all that can be done. In terms of worm burden, Worm Egg Count monitoring four to six weeks after the autumn break will help to identify the mob has a burden that is significant enough to warrant drenching. The producer drenched the mob and moved the monitor mob heifers to a paddock with more feed on offer and of higher quality to recover prior to joining.

Farm 2

Heifers had been recently moved onto a different property within the farming business. The monitor mob were pre-calving, and some were noted to be in lower body condition score (ill thrift) in May 2022. One was clinically sick with some nasal discharge, high temperature and blood-tinged urine. Blood and faecal samples were taken to investigate mob-based causes of ill thrift such as trace element deficiency and worm burden. Testing for infectious diseases was also done to investigate the cause of the clinically unwell animal exhibiting signs such as nasal discharge and bloody urine. The diseases tested for were Leptospirosis, Infectious Bovine Rhinotracheitis (IBR) and Bovine Viral Diarrhoea (BVD) also known as Pestivirus. Testing in the individual sick animal was also done to measure liver function.

On an individual animal level, the clinically sick animal had some level of liver damage, of which the cause is unknown but could be due to a toxic plant ingestion. In terms of infectious diseases, there was no evidence of IBR causing respiratory disease.

Table 4 shows there was evidence of Leptospirosis exposure in these animals, however it is difficult to know how recent the infection was and whether this was the cause of the problem. It is proof however that the disease is on the farm and so vaccination would be prudent. None of the animals were persistently infected (carriers), but they all had evidence of exposure to BVD. This means that BVD is present in the herd, however it's contribution to problems is unclear.

Table 3: Results of blood tests on the clinically sick animal for liver biochemistry markers (Farm 2).

Biochemical Marker	Normal range	Test result for clinically sick animal
T. Bil	<10 umol/L	125 (H)
Alk. Phos	<201 U/L	195
GGT	6-17 U/L	296 (H)
AST	78-132 U/L	559 (H)
GLDH	<46 U/L	326 (H)

H = high levels.

Table 4: Results of blood tests for Leptospirosis, BVD and IBR, Pepsinogen and trace elements (Farm 2).

Biochemical Marker	Animal 1 (sick)	Animal 2 (healthy)	Animal 3 (sick)	Animal 4 (healthy)	Animal 5 (healthy)
Leptospirosis hardjo	Positive Titre 400	Positive Titre 400	Positive Titre 800		
Leptospirosis pomona	Negative	Negative	Negative		
BVD persistently infected animal test (PI)	Negative	Negative	Negative		
BVD exposure antibody test	Positive Titre 2+	Positive Titre 3+	Positive Titre 1+		
IBR	Negative	Negative	Negative		
Pepsinogen (indicative of worms) 0.0-5.0 U/L	42.1 (H)	21.6 (H)	6.3 (H)	3.6	2.7
Glutathione Peroxidase (Selenium marker) 40-300 U/g Hb normal range	300	229	312	299	299
Copper 9-20 umol/L normal range	16.6	23.5 (H)	12.2	9.5	7.4 (L)
Vitamin B12 (Cobalt) 130-500 pmol/L normal range	*	459**	178**	384	336

H = high levels *L = low levels*

In terms of production limitation, Table 5 shows there was evidence of worm burdens in some animals, which was contributing to the ill thrift. In some animals from another mob (animals 4 and 5), there was also evidence of copper deficiency, which can also cause ill thrift in growing animals.

To address ill thrift of those in the group, a drench treatment and copper treatment were recommended. Regarding infectious diseases, vaccination with 7 in 1 was recommended, which covers standard clostridial bacteria as well as Leptospira bacteria. Pestivirus vaccination was not recommended but is something that requires further discussion to set a whole farm plan.

Table 5: Results of worm egg count monitor mob. (Farm 2)

Mob ID	Strongyle eggs per gram (epg)	Nematodirus epg	Total epg
HEIFERS	135	0	135

Farm 3

Heifers from the monitor mob were identified as having excessive weight loss post calving in April 2022, leading into the re-joining period. Blood samples were taken to measure trace elements, worm burdens and BVD status (Table 6).

For trace elements, the results could be seen as adequate, however the selenium levels are in the low end of the range, as are some of the copper levels. This would indicate that supplementation may be beneficial for a growth response. There were very high pepsinogen levels, which indicates a significant worm burden, which is the likely cause of the weight loss. The BVD results indicate there is low level of exposure to the virus in these animals and so they are susceptible to infection. This could be a risk as they were coming into a period of joining, and infection during gestation can lead to significant economic losses.

A recommendation to drench the group of heifers was made. Trace element supplementation would also be worthwhile. In terms of BVD, this group should be vaccinated prior to their next joining to minimise the risk of reproductive losses, however BVD management also needs to be considered at a whole of herd basis, rather than on individual mob status.

Table 6: Results of blood tests for BVD, Pepsinogen and trace elements (Farm 3).

Biochemical Marker	Animal Tag 79	Animal Tag 40	Animal Tag 78	Animal Tag 833	Animal Tag 5	Animal Tag 837
BVD exposure antibody test	Negative	Negative	Negative	Positive Titre 1+	Negative	Positive Titre 2+
Pepsinogen (Indicative of worms) 0.0-5.0 U/L	8.6 (H)	25.2 (H)	11.2 (H)	40.9 (H)	12.6 (H)	30.6 (H)
Glutathione Peroxidase-GSH Px (Selenium marker) 40-300 U/g Hb normal range	86	160	110	89	82	98
Copper 9-20 umol/L normal range	15.6	15.2	11.8	11.4	12.6	8.8 (L)
Vitamin B12 (Cobalt) 130-500 pmol/L normal range	298	419	351	242	281	336

H = high levels L = low levels

Farm 4

The farmer was trying to decide if a mob of heifers required vaccination for BVD pre-joining, as is recommended in some industry circles. Blood samples were taken from a representative sample of the group to assess the existing status of immunity of the animals. As they were accumulated from multiple properties within the farming business, they were bled in groups from their property of origin to enable trace back to those properties in case there was evidence that one may be worse than the other.

24 serum samples were tested for Bovine Pestivirus antibody ELISA, of which 22 of the 24 tested were antibody positive for BVD and two were negative. This indicates that the majority of the mob has been exposed to the virus and are therefore already carrying immunity.

There was no need to vaccinate this group of animals for BVD. There is obviously BVD present in the breeding herd, and so future management of the virus must be taken on in light of this. Annual testing of heifers pre-joining is an effective tool to reduce the need for vaccination and assess the risk to heifers leading into their first joining. This process can also be used to reduce the numbers of persistently infected (PI carrier) animals, should the producer wish to follow that path.

After budgeting the cost of two Pestivirus vaccine doses to 1,800 heifers compared to a few dry heifers, the producer made the decision not to vaccinate.

Farm 2: grass tetany prevention

With animal health being a key focus throughout the three-year project, Farm 2 used the MLA health cost-benefit calculator (Figure 1) following the 2023 calving season, to determine the cost effectiveness of using mineral blocks for the prevention of the metabolic condition of Grass Tetany. This beef enterprise has seen previous mortality rates from Grass Tetany as high as 8% within certain mobs and since then, they have conducted preventative management strategies including the provision of hay and mineral blocks during peak risk periods (lactating cows in cold weather conditions grazing on less than 1200 kg DM per ha).

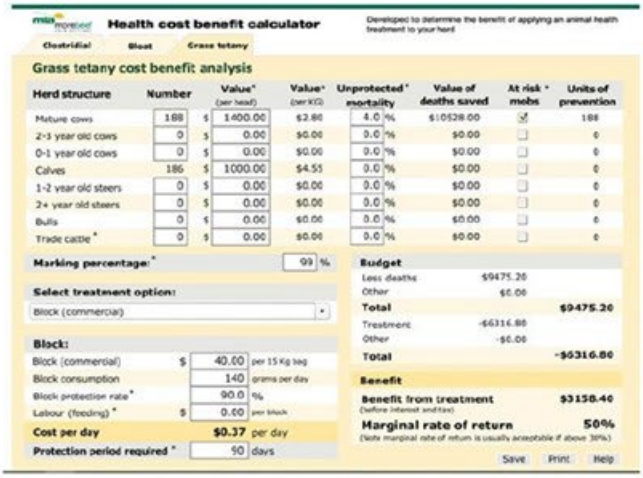

Figure 1: MLA Health cost benefit calculator

Calving in June and July, $6,300 was spent on mineral blocks and put out during June through to August 2023 (90 days) to 188 breeding cows. Table 7 shows the return on investment was 50%, assuming that cow sale values are around $1,400 per head and that a 4% loss due to Grass Tetany was prevented through treatment. No labour cost was added since blocks are normally put out when checking calving cows.

The sensitivity analysis in Table 7, shows that the break-even point for spending money on Grass Tetany prevention is around 4% mortality rates across the herd and cow values of only $1,000 per head, or alternatively a mortality rate of only 2% with a cow value of $2,000. It is important to note that this value is possibly understated as it doesn't include the loss of growth rate in the orphaned calves which is likely to be higher if the calf is orphaned at a younger age.

Table 7: Marginal rate of return sensitivity analysis with different cow values and mortality rates

	Mortality%				
Cow value / head	**1%**	**2%**	**4%**	**6%**	**8%**
$1,000	-73	-46	7	61	114
$1,200	-68	-36	29	93	157
$1,400	-62	-25	50	125	200
$1,600	-57	-14	71	157	243
$1,800	-52	-4%	93	189	286
$2,000	-46	7	114	221	329

Conclusions

Weight loss or ill thrift in heifers can often occur throughout their early reproductive life. If this coincides with a key time point, that being pre-joining, pre-calving or post-calving, there is a potential for reduced reproductive performance. Since both body weight and body condition score underpin reproductive performance, anything that effects these in a growing female at critical points should be investigated.

In growing animals, the most common cause of weight loss is intestinal worm burdens. Having an effective worm control, can assist in ensuring heifers are growing as well as they can to ensure they reach critical live weight targets for joining and calving. In the region the farms were located, there can also be significant trace element deficiency, which can affect growth and was seen in some animals. Metabolic diseases such as Grass Tetany, have the potential for high mortality rates in certain seasons, however prevention methods can be costly, especially when cow values are reduced, and the likelihood of incidence is low.

Infectious diseases, primarily Bovine Viral Diarrhoea (BVD), was found to be present in farms that were tested. However, the level of exposure varied between properties and even the different ages of heifers. Blood testing for exposure was able to demonstrate the level of risk that was present in the different groups. Testing was done leading into joining periods which are the higher risk period for production losses and so decisions on whether vaccination was required could be made. These investigations showed the importance of monitoring and investigating weight loss or ill thrift in heifers, particularly leading into critical reproductive timepoints, to achieve good reproductive performance.

Having preventative animal health plans in place, such as worm monitoring and control, mineral and trace elements supplementation and infectious disease monitoring or vaccination, can all contribute to good reproductive performance and lower mortality rates within the herd, however it is important to consider the cost-benefit of preventative treatments which may change from year-to-year.

Acknowledgements

Funding bodies

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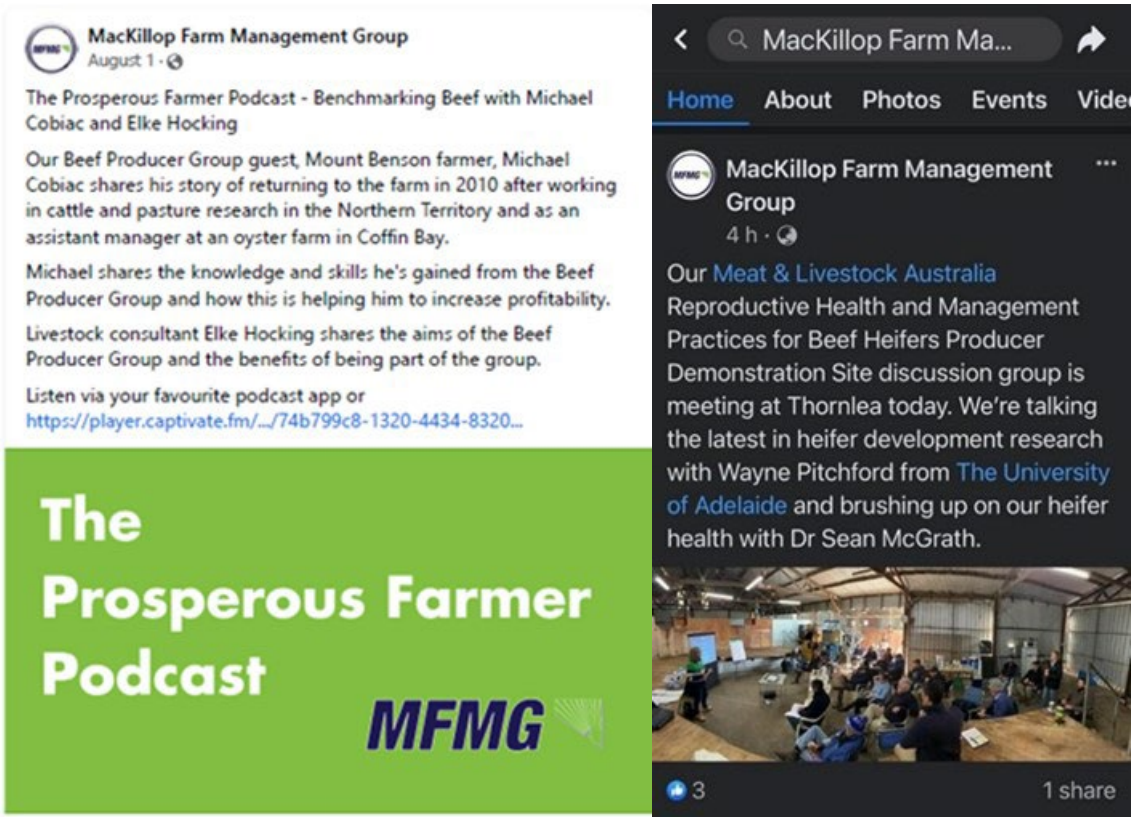
7.1.10 Social media – MFMG posts and reach



MacKillop Farm Management Group
August 25 ·

Today was the Reproductive Health and Management for Beef Heifers Results Day - presentation of initial results.

Key learning = Measure and Monitor to Manage

Thanks to everyone who attended and to South Killanoola for hosting.

Today's speakers were:

Sean McGrath, Millicent Veterinary Clinic
Nathaniel Modra, Pinion Advisory
Dean Eastwood, South Killanoola
Elke Hocking Consulting

This Producer Demonstration Site is funded by Meat & Livestock Australia and the MLA Donor company.

Peel Pastoral
May 3 at 2:56 PM ·

Last week we hosted the Beef PDS Producer Group and had a very informative day discussing all things beef herd management and pasture management. What a great way to learn from others! Thanks to all who contributed and made the day a success.

Elke Hocking Consulting MacKillop Farm Management Group Meat & Livestock Australia

MacKillop Farm Management Group
March 14 ·

Thanks Meat & Livestock Australia for featuring Elke Hocking Consulting on International Women's Day. Elke is the project manager for our Reproductive Health and Management Practices for Beef Heifers PDS.

You can hear Elke on The Prosperous Farmer Podcast, season 1, episode 2 - www.mackillopgroup.com.au/the-prosperous-farmer

MLA.COM.AU
This International Women's Day (8 March), we celebrate an impressive group of women in agriculture and gain insights into their challenges, what inspires them...

MacKillop Farm Management Group
August 21 ·

Beefing up your bottom line event

Thursday 7 September
9.00am to 2.00pm
Naracoorte... See more

MacKillop Farm Management Group
September 7 ·

Our Beefing up your bottom line event has kicked off with a producer panel discussion and question and answer.

#MFMG #beef #cattle
Meat & Livestock Australia

MacKillop Farm Management Group
September 7 ·

John Francis from Agrista Pty Ltd presenting on beef enterprise profit drivers at our Beefing up your bottom line event.

You can hear more from John on The Prosperous Farmer podcast, season 1, episode 6, www.mackillopgroup.com.au/the-prosperous-farmer

5 1 share

Like Comment Share

MacKillop Farm Management Group
September 7 ·

Mark Inglis, Farm Assurance Manager at Thomas Foods - Australia speaking on understanding the beef consumer at our Beefing up your bottom line event. Stay tuned for an episode of The Prosperous Farmer podcast with Mark.

#MFMG #beef
Meat & Livestock Australia


MacKillop Farm Management Group
21h ·
Our Meat & Livestock Australia Reproductive Health and Management Practices for Beef Heifers group celebrated their last gathering for the year with a Livestock SA Red Meat Connects SA BBQ.
The group enjoyed 36 South Beef rib-eye fillet steaks sourced locally from Teys Australia Naracoorte branch.
Thanks to the Bruce family for hosting the gathering.
#MFMG #redmeatconnectssa
+4


4:00
Elke Hocking Consulting
17 h ·
It's been a pleasure working with this group of producers over the last 3 years. Great way to finish off the project with high quality MSA graded branded beef for lunch!!
MacKillop Farm Management Group · Follow
21 h ·
Our Meat & Livestock Australia Reproductive Health and Management Practices for Beef Heifers group celebrated their last gathering for the year with a Livestock SA Red Meat Connects SA BBQ.
The group enjoyed 36 South Beef rib-eye fillet steaks sourced locally from Teys Australia Naracoorte branch.
Thanks to the Bruce family for hosting the gathering.
Write a comment...
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livestock
advisor
updates
The role of advisors for driving research adoption
Wayne Pitchford & Meg Bell
Hear how advisors and research teams can collaborate and together drive industry adoption through Producer Demonstration Sites (PDS). Learn how the key findings of the MLA funded project 'Optimising heifer development and management to increase whole herd productivity' are extended to beef producers through the PDS project to build their knowledge and skills.
Register today for the LAU Melbourne event to be held September 8.
mla
Funded by MLA and delivered by Pinion Advisory
pinion

7.2 Pre and post KASA surveys and MER results

7.2.1 Pre-KASA survey

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

MLA Producer Demonstration Sites

Pre-project Survey - Core Participants

PDS Name (to fill out by PDS coordinator): MacKillop Farm Management Group

PDS Project Code (to fill out by PDS coordinator): P.PSH.2103

The following questions are used to determine your level of understanding of reproductive health and management practices for beef cattle. The knowledge and skills audit is used at the start and completion of the program to allow individuals to track their skill development and adoption of new practices. It will also be used:

1. To improve the content of future project meetings; and
2. As part of the evaluation process for the project

The information will be completely confidential, and individuals will not be identified in the analysis of data.

Participant Name: _____

Date: / /

MLA may contact me to further assess the impact of their programs? ☐ Yes ☐ No

MLA may send me newsletters and inform me of future events? ☐ Yes ☐ No

I have read, understood and accept the terms of MLA's "PDS Participant Consent & Release" (see appendix 1) ☐ Yes ☐ No

Participant **Signature**: _____

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

Section A – Demographic Information

A1. Your contact details

Property name.....

Business / trading name .....

Property address .....

Postal address.....

Email address.....

Phone.....

Mobile.....

A2. What area do you manage? *(please write the number of hectares that you managed)*

Hectares.....

A3. What numbers of livestock do you run? *(please write the number of head against each of the categories of livestock that you run)*

Number of beef breeders.....

Number of cattle turned off per year .....

Total number of cattle.....

Other.....

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

Section B – Knowledge and Skills *(If you do not know, please select the 'Unsure' option)*

B1. What is the target critical joining weight for heifers to achieve >90% conception?
(Tick one of the options below)

250kg ☐

60-65% of mature adult weight ☐

80% of mature adult weight ☐

Other (Please describe) ☐

Unsure ☐

B2. Which are common reproductive diseases that can affect cattle? *(Tick all that apply)*

Acidosis ☐

Mucosal disease (BVD, bovine pestivirus) ☐

Vibriosis ☐

Leptospriosis ☐

Scours ☐

Lameness ☐

Grass Tetany ☐

B3. Circle the disease in QB2. that is classed as zoonotic and can be passed onto humans.

B4. Puberty in first calving heifers is related to which of the following? *(Tick all that apply)*

Liveweight ☐

Age ☐

Condition score ☐

Plane of nutrition ☐

Unsure ☐

B5. What is the ideal (most preferred) body condition score for heifers going into joining?
(Tick one of the options below)

BCS 1 – 2 ☐

BCS 2 – 3 ☐

BCS 3 – 4 ☐

BCS 4 – 5 ☐

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

B6. When selecting bulls to use in a self-replacing herd, which EBV's can influence the reproductive performance of his daughters? *(Tick all that apply)*

Gestation Length ..... ☐

IMF% ..... ☐

Calving ease (direct)..... ☐

Birth weight ..... ☐

200-day weight..... ☐

Scrotal Size ..... ☐

B7. What is the ideal time to detect foetal age using ultrasound pregnancy scanning?
(Tick one of the options below)

7 months from joining ..... ☐

Prior to 90 days from joining..... ☐

Prior to 35 days from joining ..... ☐

150 days from joining ..... ☐

B8. How many MJ of energy does a 500kg dry cow require to maintain her body condition
(Tick one of the options below)

25 MJ ME/kg..... ..... ☐

55 MJ ME/kg..... ..... ☐

75 MJ ME/kg..... ..... ☐

95 MJ ME/kg..... ..... ☐

B9. Worm egg counts are an accurate way of determining worm burdens in cattle under 15 months of age .... True / False

B10. Ostertagiosis Type 2 can be detected by worm egg counts in older cattle...
.... True / False

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

Section C – Confidence and Practices

C1. How confident are you are you in measuring Body Condition Score (BCS) in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C2. How confident are you in managing your herd according to their nutritional requirements?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C3. How confident are you that you can accurately assess pasture quality and quantity?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C4. How confident are you in managing reproductive and metabolic diseases in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C5. How confident are you in managing parasites (including worms) in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C6. How confident are you in using Breedplan EBV's to select bulls to lift productivity in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

Section D - Practices

Please note how frequently you currently use the following practices across your entire business *(tick the response which applies to you):*

	Normal practice	Sometimes	Rarely	Never	Not Applicable
1. Calculate production efficiency of your herd **(kg meat produced / hectare)**					
2. Calculate **beef cost of production** (c/kg carcase or liveweight)					
3. Record **pasture quantity** (kg/ha) and **quality** throughout the year					
4. Record herd performance data annually for the following: a) **Reproductive efficiency = number of calves weaned to cows joined** - weaning % of heifers - weaning % of 2nd calvers - weaning % of older cows - overall herd weaning %					
5. Keep **individual records** on reproductive performance?					
6. Record **mortality rates** and cause of death in the herd.					
7. Have a **documented yearly animal health plan** for your herd?					
8. **Assess body condition** at key points in the reproductive cycle?					
9. **Pregnancy scan:** - heifers - second calvers - older cows					
10. Record **foetal age** when pregnancy scanning: - heifers - second calvers - older cows					
11. Have a **Breeding objective** and use EBV's when selecting bulls?					
12. Manage the herd for a **6-9 week joining**?					

PRODUCER DEMONSTRATION SITE (PDS)
PARTICIPANT CONSET & RELEASE

MEAT & LIVESTOCK AUSTRALIA

As a host of a demonstration site for MLA's Producer Demonstration Sites (PDS) program, from time to time certain information about you may be included in reports, case studies, factsheets, images, videos, articles and other material developed during the course of the PDS program. This information may include your name, property name and location (as the identifier each of demonstration site), photographs of you engaged in demonstration activities and quotes provided by the project facilitator (**Materials**). Please note that full property addresses and contact numbers of site hosts will not be published.

As you would be aware, many producers learn by hearing from or observing their peers. Therefore, components of PDS program outputs which include the Materials may be made publicly available (e.g. shared via social media, rural press, print media, and website views) to demonstrate to a broad audience the value, implementation and benefits of particular management practices, technologies or tools.

MLA requires each demonstration site host to consent to MLA publishing the Materials in various platforms, including:

- on the MLA website
- shared via media channels
- newspaper advertisements
- promotional material for the MLA PDS program

The terms of the consent required by MLA to enable your participation in the PDS program are as follows:

1. As a producer demonstration site host, you consent to MLA:
   (a) using the Materials at events associated with the above mentioned PDS Program;
   (b) using, reproducing, publishing and otherwise communicating, exhibiting or distributing the Materials (in full or in part) in all formats and all media now known or later devised throughout the world; and
   (c) adapting and editing the Materials at its sole discretion.

2. You also understand and agree that:
   (a) you are not entitled to any remuneration for the exploitation of the rights described in item 1 above;
   (b) you will not have any interest in the Materials or in the copyright or any other rights in the Materials; and
   (c) MLA may use your likeness and the Materials to promote its activities and programs.

3. You release MLA from any claim by you or anyone on your behalf arising out of use of the Materials and/or your appearance in promotional campaigns in which the Materials are used.

4. You understand and agree that any information, including personal information, provided by you when participating in a PDS project will be collected by your PDS project facilitator and provided to MLA. You consent to MLA collecting, using and handling your information for the purpose of the PDS program, any purposes set out above and as otherwise specified in MLA's privacy policy located at https://www.mla.com.au/general/privacy/. You can request access to, correction and deletion of your personal information by contacting MLA using the contact details on its website.

Please indicate your acceptance of the above by completing the relevant sections and returning a copy to your PDS project facilitator.

If you have any queries, regarding this consent, please contact your PDS project facilitator. Alternatively, you can contact MLA's project manager of the PDS Program Alana McEwan by calling 0417 541 000 or emailing at amcewan@mla.com.au.

7.2.2 Post-KASA survey.

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

MEAT & LIVESTOCK AUSTRALIA

MLA Producer Demonstration Sites

Post-project Survey - Core Participants

PDS Name: Mackillop Farm Management Group: Reproductive Health and Management Practices for Beef Heifers

PDS Project Code: P.PSH.1280

The following questions are used to determine your level of understanding of *reproductive health and management practices for beef cattle* following your participation in the above producer demonstration site project. The knowledge and skills survey is used at the start and completion of the program to allow individuals to track their skill development and adoption of new practices. The information will be used as part of the evaluation process for the project and MLA's PDS program. The information will be completely confidential, and individuals will not be identified in the analysis of data.

Section A – Demographic Information

Participant Name: _____

Company/Business Name: _____

Area managed (ha) _____

Number of beef breeders _____

Number cattle sold/year _____

Other _____

Your Thoughts on your involvement in this project (Scale 1 = Poor, 5 = Average, 10 = Excellent)

Overall, how satisfied were you with the content of this project? _____/10

How valuable has your involvement in this project been in assisting manage your Beef enterprise?

_____/10

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

MEAT & LIVESTOCK AUSTRALIA

What have you enjoyed most about being involved in this 3-year Beef PDS project

Any other comments or suggestions for improvement

Section B – Knowledge and Skills *(If you do not know, please select the 'Unsure' option)*

B1. Overall, how well has this PDS project increased your knowledge of the reproductive health and management practices for beef cattle.

Please rate out of 10 by marking your choice below, 1 = No Increase, 10 = very large increase

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

B2. Overall, how well has this PDS project increased your skills in managing your beef cattle for health and reproduction.

Please rate out of 10 by marking your choice below, 1 = No Increase, 10 = very large increase

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

PRODUCER DEMONSTRATION SITE (PDS)
Post KASA survey

B3. What is the target critical joining weight for heifers to achieve >90% conception?
(Tick one of the options below)

250kg ☐
60-65% of mature adult weight ☐
80% of mature adult weight ☐
Other (Please describe) ☐
Unsure ☐

B4. Which are common reproductive diseases that can affect cattle? *(Tick all that apply)*

Acidosis ☐
Mucosal disease (BVD, bovine pestivirus) ☐
Vibriosis ☐
Leptospriosis ☐
Scours ☐
Lameness ☐
Grass Tetany ☐

B5. Circle the disease in QB4. that is classed as zoonotic and can be passed onto humans.

B6. Puberty in first calving heifers is related to which of the following? *(Tick all that apply)*

Liveweight ☐
Age ☐
Condition score ☐
Plane of nutrition ☐
Unsure ☐

B7. What is the ideal (most preferred) body condition score for heifers going into joining?
(Tick one of the options below)

BCS 1 – 2 ☐
BCS 2 – 3 ☐
BCS 3 – 4 ☐
BCS 4 – 5 ☐

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

B8. When selecting bulls to use in a self-replacing herd, which EBV's can influence the reproductive performance of his daughters? *(Tick all that apply)*

Gestation Length ..... ☐

IMF% ..... ☐

Calving ease (direct)..... ☐

Birth weight ..... ☐

200-day weight..... ☐

Scrotal Size ..... ☐

B9. What is the ideal time to detect foetal age using ultrasound pregnancy scanning?
(Tick one of the options below)

7 months from joining ..... ☐

Prior to 90 days from joining..... ☐

Prior to 35 days from joining ..... ☐

150 days from joining ..... ☐

B10. How many MJ of energy does a 500kg dry cow require to maintain her body condition
(Tick one of the options below)

25 MJ ME/kg..... ..... ☐

55 MJ ME/kg..... ..... ☐

75 MJ ME/kg..... ..... ☐

95 MJ ME/kg..... ..... ☐

B11. Worm egg counts are an accurate way of determining worm burdens in cattle under 15 months of age..... True / False

B12. Ostertagiosis Type 2 can be detected by worm egg counts in older cattle
.....True / False

PRODUCER DEMONSTRATION SITE (PDS)
Post KASA survey

Section C – Confidence and Practices

C1. How confident are you are you in measuring Body Condition Score (BCS) in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C2. How confident are you in managing your herd according to their nutritional requirements?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C3. How confident are you that you can accurately assess pasture quality and quantity?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C4. How confident are you in managing reproductive and metabolic diseases in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C5. How confident are you in managing parasites (including worms) in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

C6. How confident are you in using Breedplan EBV's to select bulls to lift productivity in your herd?
(Please rate out of 10, with 1 being poor and 10 being very good, by circling your choice below)

1 2 3 4 5 6 7 8 9 10

Poor Excellent

PRODUCER DEMONSTRATION SITE (PDS)
Post KASA survey

MEAT & LIVESTOCK AUSTRALIA

Section D - Practices

Please note how frequently you currently use the following practices across your entire business.
(tick the response which applies to you):

Practices	Practice Implemented?	Indicate on what % of your enterprise this practice has been adopted (if not adopted leave blank)	Frequency of use? (if not adopted leave blank)
1) Calculate production efficiency of your herd **(kg meat produced / hectare)**	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
2) Calculate **beef cost of production** (c/kg carcase or liveweight)	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
3. Record **pasture quantity** (kg/ha) and **quality** throughout the year	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

Practices	Practice Implemented?	Indicate on what % of your enterprise this practice has been adopted (if not adopted leave blank)	Frequency of use? (if not adopted leave blank)
4. Record herd performance data annually for the following: a) **Reproductive efficiency = number of calves weaned to cows joined** - weaning % of heifers - weaning % of 2nd calvers - weaning % of older cows - overall herd weaning %	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
5. Keep **individual records** on reproductive performance?	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
6. Record **mortality rates** and cause of death in the herd.	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

MEAT & LIVESTOCK AUSTRALIA

Practices	Practice Implemented?	Indicate on what % of your enterprise this practice has been adopted (if not adopted leave blank)	Frequency of use? (if not adopted leave blank)
7. Have a **documented yearly animal health plan** for your herd?	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
8. **Assess body condition** at key points in the reproductive cycle?	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
9. **Pregnancy scan:** - heifers - second calvers - older cows	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

MEAT & LIVESTOCK AUSTRALIA

Practices	Practice Implemented?	Indicate on what % of your enterprise this practice has been adopted (if not adopted leave blank)	Frequency of use? (if not adopted leave blank)
10. Record **foetal age** when pregnancy scanning: - heifers - second calvers - older cows	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
11. Have a **Breeding objective** and use EBV's when selecting bulls?	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		
12. Manage the herd for a **6-9 week joining?**	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Lack of confidence ☐ Lack of skills ☐ Limited funds ☐ Limited time ☐ Other (please specify)		

PRODUCER DEMONSTRATION SITE (PDS)

Post KASA survey

MEAT & LIVESTOCK AUSTRALIA

What practices that you have implemented have had the biggest impact on your beef enterprise and why?

(These could be impacts on management efficiencies, animal health, reproduction and mortality rates, overall production and profitability)

Thankyou for your inputs and participation throughout the last 3 years.

7.2.3 Full monitoring, evaluation and reporting (MER) report.

Evaluation level[1]	Project Performance Measures	Evaluation Methods	*Progress to end of December 2023*
Inputs – What did we do? *Describe the planned and expected inputs involved in your project*, including *funds, resources, development & projects structures.*	• 8 core producers will comprehensively measure and monitor pasture quantity and quality, Condition Score (CS) and heifer performance from weaning through to second calving in the cool/cool temperate climate region of the Limestone Coast in the South-East of SA. • 4 producers (from within the core group) will record the impact of different health issues and disease burdens on the overall reproductive rates of heifers and second calvers over a 3-year period. • 5-10 additional businesses regularly attending PDS sessions and observing demonstration sites. • 50 broader industry personnel observing demonstration sites via alternate producer group channels (MFMG field days) • Project steering committee consists of 8 businesses. • $70,000 contributed by MLA levy funds. • $38,000 contributed by MLA donor company (matching funds). • $38,000 contributed by producers. • $5000 - $6000 contributed by external companies.	• 8 core producers will submit individual animal records for reproductive rates over the three-year project. • 5 additional businesses will submit mob-based data on reproductive rates over the three-year project. • Pre and Post KASA surveys will be used to assess skills, confidence, practices, and knowledge.	• *Mob data on reproductive performance for the 2020 drop heifers has been submitted by 10 businesses. Baseline data has also been submitted from 2017, 2018 and 2019 mobs.* • *Individual records submitted by 1 producer.* • *Pre-KASA surveys were returned by 24 producers. We received at least one pre-KASA survey per business involved in the project.* • *Post-KASA surveys returned by 19 producers from 13 businesses.* - *91% Overall satisfaction with the content of the project* - *86% was the value of the project reported by producers in assisting them in managing their beef enterprises.* - *The PDS project increased participants knowledge of the reproductive health and management practices for beef cattle by 78%.* - *The PDS project increased participants skills in managing their beef cattle for health and reproduction by 78%.*

[1] Note: The headings in column 1 are also listed in the PDS Final Report template.

		• Numbers attending additional industry field days / seminars will be reported. • Numbers indirectly engaged through social media and other communications. • Notes of discussions from sessions will be recorded. • Number of head of livestock within the producer group will be reported (Breeding cow numbers). • Area (ha) within the producer group will be reported.	• *See numbers reported below for attendance.* • *Social media:* - *Post to advertise Session 3.* - *Post demonstrating activity at Session 6.* - *Post to advertise Session 7, post demonstrating activity at Session 7.* - *Post advertising presentation about project at Livestock Adviser Essentials workshop in Melbourne, September 2022.* - *Post from MFMG promoting a podcast from the project.* - *Post following Session 9 from producer host (Peel Pastoral)* - *6 posts for September "Beefing up your Bottom-line event."* - *Post following Session 10 showing activity at final session.* • *Session plans and notes have been recorded and reported in milestone reports.* • *18,600 breeding cows within the producer group (current data)* • *49,000 ha within the producer group (current data.)*

Outputs - What did we do? *Describe the outputs planned/expected from your project, including engagement activities & products from demonstration sites.*	• Interactive skill development workshop – host farm visit. • 7 host farm visits (2 host farms per session). • 3 MFMG Livestock Field Days. • 3 online or face-to-face technical sessions with an industry or veterinary expert. All done face-to-face.	• Assessment of the impact from communication and extension activities beyond the producer group will be measured by the number and type of extension activities carried out within and post project completion. Where possible, this will include the collection of the number of breeding cows within the audience to demonstrate potential impact to the beef industry.	• *Interactive skill development workshop (Session 1 Dec 2020) – body condition scoring, pasture assessment, peer to peer discussions of breeding herd management. These skills were practiced at all host farm visits throughout the project.* • *11 host farm visits – 1 host farm Dec 2020, 2 host farms March 2021, 1 host farm May 2021, 1 host farm Dec 2021, 1 host farm March 2022, 1 host farm May 2022, 1 host farm August 2022, 1 host farm December 2022, 1 host farm April 2023, 1 host farm December 2023.* • *Technical session (Session 3) -10,880 beef breeders.* - *Face-to-face technical session (Session 3) on Cattle animal health held May 2021 with veterinary expert Andrew Whale, Livestock Logic (cattle worm management and metabolic disorders through pregnancy and lactation) and Gary Glasson, Zoetis (preventative management and vaccination of reproductive and respiratory diseases in cattle).* • *Technical session (Session 4) – 9,030 breeders.* - *Face-to-face technical session (Session 4) on Beef Genetics, Bull structural soundness and heifer nutrition was held in December 2021. Bull Genetics session – Understanding EBV's was*

			presented by Penny Schulz (Schulz Livestock). Nutritional requirements of heifers, Bull structural soundness and a demonstration of bull fertility testing was presented by Sean McGrath (Millicent Vet clinic). • *Technical session (Session 5) 13,670 breeders.* - *Face-to-face technical session (Session 5) on Nutritional requirements of breeding cattle and calving issues was held in March 2022 and presented by Ash Hunt (Tailored Livestock consulting) and Sean McGrath (Millicent Vet clinic)* • *Technical session (Session 6) 15,370 breeders.* - *Face-to-face technical session (Session 6) on Hybrid vigour and animal health case studies was held in May 2022 and presented by Dr Wayne Pitchford (The University of Adelaide) and Sean McGrath (Millicent Vet clinic)* • *Mackillop Livestock Field Day (Session 7) 21,405 breeders (13,395 no. head sold).* • *Face-to-face technical session open to producers outside the group held in August 2022.* - *Presentations from Sean McGrath (Millicent Vet clinic) on logistics of AI, foetal ageing and pregnancy scanning, Nathaniel Modra (Pinion)*

			on profitability of beef enterprises and Dean Eastwood (South Killanoola Beef PDS producer) as the host producer and also spoke on the use of reproductive technologies and eID within beef enterprise. • *Session 8 face-to-face technical session held on host property, 16,000 breeders.* - *Presentations by Wayne Pitchford (The University of Adelaide) on the linked Heifer development project, Darren Koopman (Economic calculator), Ian Johnson (host beef PDS producer), Andrew and Sam Bell (producers involved in both University project and Beef PDS).* • *Technical Session 9 face-to-face technical session held on host property. 10,000 breeders.* - *Presentations by host, Beef PDS participants, Ash Hunt (Tailored Livestock consulting), Elke Hocking and Sean McGrath from the Millicent Vet clinic to answer animal health questions.* • *September 2023 Mackillop Livestock Field Day. 10,310 breeders from PDS group+ 4,767 breeders from the other producers in attendance.* - *Presentations by John Francis on Beef profit drivers (Agrista) and Mark Inglis (TFI) on understanding the customer.*

		• An increase in the reproductive rate of first time and second time calving heifers (joining to weaning) as evidenced by pre and post data collection of reproductive efficiency & KPI's and general herd statistics to measure the impact of the project within the region. Baseline data has been collected from most core producers prior to project commencement. This data will form the baseline for monitoring and evaluation purposes.	• *Technical Session 10 face-to-face held on host property. 8,480 breeders.* - *Presentations by host, Beef PDS participants, with Ash Hunt (Tailored Livestock Consulting), Meg Bell (Coleraine Livestock Consulting), Sean McGath from the Millicent Vet clinic and Tim Prance (T. Prance Rural Consulting) to answer questions within producer discussions.* • *There has been an increase in the reproduction rates in the most recent drop of heifers (2021 drop joined in 2022 to calve in 2023). Conception rates were 84% with 94% calves born alive to those who calved. The biggest impacts have been on a reduction from 13% down to 4% of heifers needing assistance at calving and a reduction in heifer mortality from 2.7% to 0.6%.* • *The monitor mob (2020 drop) didn't have significantly higher reproductive rates as heifers compared to baseline levels, however achieved 92% re-conception rates as second calvers (compared to the baseline of 88%. This is likely due to applying what they learnt in 2021 and 2022 and to influence their results in 2022/2023.*

		• Numbers attending additional industry field days / seminars will be reported.	• *<u>Dec 2020</u>: 14 producers representing 10 businesses attended Session 1.* *<u>March 2021</u>: 20 producers representing 15 businesses attended Session 2.* *<u>May 2021</u>: 17 producers from 12 businesses attended the farm tour prior to technical session. 21 producers from 14 businesses attended the technical session, plus 8 other people (not within group)* *<u>August 2021</u>: Of the 40 attendees to the MFMG Livestock Field Day, 3 producers were from the PDS project, and the remainder were external to the group (Including 7 consultants and 1 media representative).* *<u>December 2021</u>: 20 producers from 15 businesses attended. Additionally, 3 early career professional consultants attended as observers and 4 consultants were involved.* *<u>March 2022:</u> 24 producers from 15 businesses attended. Additionally, 3 consultants were involved.* *<u>May 2022:</u> 23 producers from 15 businesses attended. Additionally, 3 researchers from Ad. Uni (2 early career post-docs), 1 early career Ag. Science graduate and 3 consultants were involved.* *<u>August 2022:</u> Attended by 40 people. 33 producers from 17 businesses (21 producers from 12 businesses within the PDS and an additional 12 producers from 5 businesses outside*

	• 3x 5-minute project summary videos for MFMG's (shorter snippets for social media platforms and newsletter). • 3x in-depth articles (MFMG trial book).	• Numbers indirectly engaged through social media and other communications.	*of the group). Additionally, 2 veterinarians, 4 consultants and 1 media person (Stock Journal) were involved.* *December 2022: Attended by 22 people. 19 producers from 12 businesses within the PDS and 3 consultants were involved.* *April 2023: Attended by 21 people. 17 Beef PDS producer participants (7 businesses), representing 10,000 breeders and 4 consultants.* *September 2023: Of the 46 attendees to the MFMG Livestock Field Day, 20 producers were from the PDS project (12 businesses), 14 producers external to the group, 9 consultants, 2 NAB bank staff and 1 meat processor.* *December 2023: Attended by 23 people. 17 producers (9 businesses) and 6 consultants.* • *The majority of the communications have been within the group through email communications.* • *Photos contributed for MLA's FEEDBACK magazine along with interview on the project with MLA Comms team (Eliza Fessey).* • *SALRC link to FEEDBACK article.* • *MFMG 2021 trial book released and available to all MFMG members.* • *MFMG Spring Newsletter 2023 released to MFMG members mid-December 2022 and released on the*

	• 2 case studies. • MFMG website project page communications. • 3x podcasts. • 9x social media posts		*public website early 2023. MFMG currently has 369 members.* • *Feedback magazine article "Hot Tips for top heifers" and case study (Winter edition 2023)* • *MFMG 2023 trial book released and available to all MFMG members.* • *Short videos on body CS, AI, Preg-testing (foetal aging), profit drivers and benefits of being in the group have all been recorded.* • *4 case studies written and included in final report.* • *MFMG public website project page developed with links to podcast and presentations from Session 7.* • *4 podcasts throughout the project on The Prosperous Farmer Podcast:* - *Season 1, Episode 2, 27th June 2022: Benchmarking Beef with Michael Cobiac and Elke Hocking.* - *Season 1 Episode 6, 25th July 2022: Driving farm productivity and profitability with John Francis.* - *Season 2, Episode 2, 20th January 2023: Maximising beef production with Dean Eastwood and Sean McGrath.* - *Season 4, Episode 2, 28th November 2023: The future of meat processing with Mark Inglis* • *At least 15 social media posts throughout project.*

	• Key performance metrics – reproductive efficiency (calf weaning %), mortality rates % (breeding cows and calves to weaning), pasture productivity (kg DM/ha) and quality, production efficiency (kg lwt /ha). • Profitability measures – COP ($/kg lwt). • Cost-benefit of animal health treatments. • Road-test Adelaide Uni financial tool to improve decisions on -farm.		• *These metrics have been reported within the final report.* • *Some profitability measures were reported in individual case studies, as well as the maternal productivity decision support tool used by a couple of producers.* • *Cost-benefit of grass tetany treatment was reported in final report using the MLA health cost benefit calculator.* • *Ad. Uni maternal productivity decision support tool has been utilised in a couple of one-on-one property visits and results of host property presented at Session 9 to producers (reported in final report).*
Changes in knowledge, attitudes, and skills - How well did we do it? *Describe the changes in KASA that you are planning to achieve*.	By December 2023, in the Limestone Coast region of South Australia: • 100% of the producer group (8 core + 5 observer) will have improved their skills, confidence, and knowledge in the following areas in relation to the management of heifers and second calvers: - Live animal assessment (CS) - Pasture availability and quality assessment. - Routine pregnancy scanning - Records of reproductive data - Management of heifers according to liveweight	• Producer's knowledge, skills and adoption questions will be developed and assessed pre and post PDS project. Adoption questions will be based on current practices compared to practices post project. Some baseline data has already been collected through phone interview. Success will be the implementation of best practice health and management techniques demonstrated within the project.	• *Skill development sessions of live animal assessment of body condition score, pasture availability and quality assessments are carried out at each host farm visit.* • *The importance of recording, monitoring, and evaluating reproductive data is reinforced at every session. Reproductive data has been submitted for monitor mob from 10 producers.* • *Pre- and post-KASA questions have captured pre- and post-workshop confidence, knowledge, and practices.*

	- Understanding of nutritional requirements - Awareness of how to identify and prevent losses due to animal health conditions.	• Skill development will be assessed through confidence questions pre and post project. Additionally, within the core group of 12 producers, the assessment of condition score and feed on offer (pasture productivity kg DM/ha) and feed quality skills will be measured against the facilitator and peers throughout the project's on-farm discussion group meetings. • Producers understanding of economic impacts of different management systems on the productivity and profitability of their beef enterprise at a whole farm systems level (i.e. calving time). Success will be measured by a quarter of producers within the group being willing to undertake some form of financial analysis of their beef enterprise following the conclusion of the project.	*Post-Kasa Results:* - *There has been an increase in knowledge from 66% to 85%.* - *There has been an increase in overall confidence from 65% to 78%.* - *Final KASA survey showed participants confidence levels at 80% for: BCS assessment, managing herd according to nutritional requirements, assessment of pasture quality and quantity, managing reproductive and metabolic diseases in the herd, and using BREEDPLAN EBV's to select bulls to lift herd productivity.* - *They also had 90% confidence in managing parasites (including worms) in the herd.* • *Only 26% of the group calculated their Beef COP and kg meat per ha at the start of the project. Post KASA survey results showed that a further 26% have adopted calculating their Beef COP and a further 32% intend to adopt. Therefore, 84% of the group are already doing or intend to undertake some form of financial analysis of their beef enterprise. There have been a couple of members interested in doing full financial benchmarking.*

			• *Host producer (Session 4) presented a 4-year summary of his Beef Enterprise financial and production KPI's. This created discussion within the group around the economic impacts of different calving & management systems (stocking rate, fertility, liveweight & CS targets, and sale weight implications).* • *Session 7 addressed profit drivers within the beef enterprise- presentation by Nathaniel Modra (Pinion).* • *Session 8 Darren Koopman from The University of Adelaide presented on the impact of different scenarios on profitability of the beef enterprise as well as demonstrating the maternal productivity decision support tool (using data from within the beef group).* • *Session 9 Elke Hocking presented a snapshot from financial benchmarking on key Beef enterprise financial and production KPI's. The host farm, Peel Pastoral, presented their data they had entered into the Adelaide University maternal productivity decision support tool.* • *September Livestock Field Day "Beefing Up your bottom line" had John Francis presenting on key profit drivers for beef in the morning session and then held an interactive workshop in the afternoon on partial budgeting analysis.*

	• 20% of the ***observer group (50 additional producers***) will have engaged in the project through either online webinar forums or field days and increased their knowledge and skills in relation to heifer and second calver reproductive performance.		• *Over the course of the project, an additional 60 people have been engaged in the project through attendance at wider engagement events of the Mackillop Farm Management group livestock field days. Of these extras, 46 have been producers and the remaining 14 have been either Livestock advisers, Veterinarians or Researchers.* - *Dr. Wayne Pitchford presented on some results from the associated Ad. Uni MLA project: "Optimising heifer development and management to increase whole herd productivity" at the August 2021 MFMG livestock field day. This workshop was attended by an additional 20 producers (not within the Beef PDS group).* - *12 producers from 5 businesses outside of the group attended the MFMG livestock field day (Session 7) at South Killanoola in August 2022.* - *14 producers external to the group attended the MFMG September 2023 event.*

Practice changes – Has it changed what people do? *Describe the practice changes that you are expecting to achieve by the end of your project.*	• ***12 core producers*** will comprehensively measure and monitor pasture quantity and quality, condition score and heifer performance from weaning through to second calving. • ***4 producer heifer demonstration sites*** (from within the core producer group) will also record the impact of different health issues and disease burdens on the overall reproductive rates of heifers and second time calvers over a 3-year period and develop. • a cost-benefit analysis for preventative health treatments. • As a result of adoption of selected management techniques demonstrated or discussed within the PDS, 70% of producers within the ***core group*** will have increased their reproductive performance, along with having reduced mortality rates relative to their baseline data where possible. • 10% of the ***observer group*** **(25 additional producers)** will have adopted or intend to adopt selected management techniques demonstrated or discussed within the PDS.	• Adoption/practice change questions in the pre and post surveys. • Core producers results over the 3 years to demonstrate improved reproductive rates, well-defined management, and nutrition strategies prior to joining and calving (including pregnancy scanning, foetal aging, well defined animal health plan, and a clear breeding objective). • Evaluation questions at field days to ask whether producers intend to make a change as a result of attending the day.	• *T. Prance Consulting has assisted producers on-farm with pasture assessments at weaning and joining.* • *Body condition scoring and pasture assessment has been practiced at every Session by producers in attendance.* • *Collection of faecal and blood samples has been done on 3 core producer properties by local vet to assess cause of weight loss in heifer monitor mobs.* • *Another property has conducted testing on pesti-virus.* • *25 evaluation surveys were returned from the technical Animal health workshop (Session 3). Out of a possible score of 10, the workshop was rated 9.2 for overall satisfaction and 9.0 for value to their businesses. Guest speakers rated 9.5 for Andrew Whale and 7.9 for Gary Glasson. Surveys indicated that 100% of attendees would recommend the workshop to others, 68% would make changes. Of the 32% not intending to make changes, 16% were already doing and 16% were non-producers.* • *MFMG Livestock Field Day evaluations for Dr. Wayne Pitchford returned a result of 4.7 where a score of 5 was excellent.* • *21 evaluation surveys were returned from the technical Beef Genetics/Bull Fertility workshop (Session 4). Out of a possible score of 10, the workshop*

			was rated 8.9 for overall satisfaction and 9.0 for value to their business. Guest speakers were rated 9.1 for Penny Schulz and 9.0 for Sean McGrath. The interactive session on bull fertility testing/Pasture assessment and BCS was rated at 8.5. 100% of attendees would recommend the workshop to others, 56% would make changes to their businesses. Those who answered no to making changes were either not producers or were already doing it. • *22 evaluations were collected verbally at the end of Session #5. Out of a possible score of 10, this workshop was rated 8.5 for overall satisfaction for content and 8.3 for value to their business.* • *17 evaluation surveys were returned from the technical hybrid vigour/animal health workshop (Session 6). Out of a possible score of 10, the workshop was rated 8.5 for overall satisfaction and 8.3 for value to their business. Guest speakers were rated 8.4 for Sean McGrath and 9.2 for Wayne Pitchford. 29% would make changes to their businesses. 59% were not sure if they would make changes (already doing), with 12% not sure as this was their first session they had attended (new employees within the business)* • *30 evaluation surveys were returned from the technical reproductive*

			technologies and beef profitability Mackillop Farm Management Group Livestock field day (Session 7). Out of a possible score of 10, the workshop was rated 8.8 for overall satisfaction and 8.5 for value to their business. Guest speakers were rated 8.9 for Elke Hocking and Dean Eastwood (Beef PDS results and facilitated discussion), 8.4 for Nathaniel Modra (Beef profitability), 8.7 for Sean McGrath (Pregnancy scanning and foetal aging and Artificial Insemination. 48% of the audience planned to make changes because of attending the workshop, with 19% not sure or already doing and 33% said they wouldn't make any changes as they were employees or non-producers. • *30 evaluation surveys were returned from the September 2023 Mackillop Farm Management Group Livestock Field Day "Beefing Up your Bottom Line". Out of a possible score of 5, the workshop was rated 4.3 for overall value, 3.9 for Mark Inglis's presentation, 4.4 for John Francis's presentation and 3.6 for the Q&A panel session with producers. 100% Agreed or strongly agreed that the content of the activity was relevant in helping to manage their beef enterprise and 93% of participants agreeing or strongly agreeing that*

			they were likely to make a practice change as a result of attending. • *18 evaluation surveys were returned from the September afternoon interactive workshop with John Francis. Out of a possible score of 5, participants gave a rating of 4.2 for the overall value of the workshop and 95% agreeing or strongly agreeing that they would make changes as a result of attending.*
Benefits – Is anyone better off? *Describe the benefits that you are expecting to achieve as a result of the project.*	• Benefits / impacts from beef producers implementing well-defined animal health management, breeding, and nutrition strategies to achieve weight and CS targets prior to joining and calving, will lead to a decreased mortality rate of cows and calves and a higher reproductive rate compared to baseline figures within the group. • Producers will be able to develop a set of best practices methods to improve heifer reproduction from weaning to second calving.	• Benefits of the project will be measured through data collected throughout the project compared to baseline figures and also through Pre and Post KASA surveys, case studies, economic modelling, and decision support tool examples.	• *Pre-and Post KASA surveys have been collected and analysed.* • *Case studies have been written for several of the beef enterprises within the group.* - *Michael Cobiac: focus on financial benchmarking and changing calving time.* - *Elke and Peter Hocking: focus on the use of eID, foetal aging, bull fertility testing, prevention of grass tetany and changing calving time.* - *Ian Johnson: focus on the use of foetal aging.* - *Darcy Bateman – Feedback magazine* - *Animal health case studies (Darcy Bateman, Peter and Elke Hocking, Ian Johnson)*

	• Producer directly involved will increase their management skills and confidence in regard to livestock and pasture management, as well as understanding the importance of economic analysis of their business.	• The ***core producers*** will be well-linked into the MLA R&D project B.GPB.0038, with extension and adoption activities continuing beyond the life of the PDS project.	• *Economic modelling of the maternal productivity decision support tool has been utilised within the group.* • *Whilst the presentation from Dr. Wayne Pitchford at Session 6 was on hybrid vigour, he was present for the entire day and was able to contribute to the interactive discussions throughout the day where producer data was matching what they were seeing within the MLA R&D project B. GPB.0038. One post-doc student working in this project also attended and contributed to discussions.* • *Wayne Pitchford and Darren Koopman presented at Session 8 on results and extension tools from the MLA R&D project B. GPB.0038 They discussed with the group how they would like extension messages to be presented. This was a productive 2-way discussion between the researchers and producers with both gaining significant value.* • *A couple of producers have road-tested the maternal productivity decision support tool and provided feedback to Darren Koopman on ease of use and usefulness.*

	• Benefits to the wider SA beef industry includes the development of an ongoing dedicated beef discussion group that can be consulted by research organisations to 'road-test' R&D outputs of projects, including the maternal productivity decision support tool (B GBP 0038).		• *At the December 2023 final session, the group decided to continue for a further 2.5 years as a beef discussion group. A planning session was held, and topics included to continue to fine-tune what they have learnt over the last three years as well as hear from other invited guest speakers. The consultants involved within this project will continue to be involved.* • *This group is likely to be connected into future Beef RD&A projects.*
General observations / outcomes – Is the industry better off?	• Potential impacts (practice change & productivity) at the end of the project and well after the project has concluded (e.g. 2 years later) for the broader target audience.	• Evidence that a greater number of beef producers are engaged in education or discussion groups (only one in the state prior to this PDS). • Beef producer groups well-linked into R&D projects.	• *Beef producer group established for the project, representing 18,550 breeding cows within SA. A couple of producers have expanded their land holdings and breeding numbers. One of the ways they are trying to increase their numbers is through increasing heifer reproductive rates. The scenario modelling (from the 'Herd Inventory Management Strategies' project funded by the future drought fund) presented by Darren Koopman, was informative for showing the most profitable strategies for building your herd is to join and retain more heifers or purchase young cows (in the current economic environment).* • *Mackillop Farm Management group field day in August 2021: Adelaide University R&D project speaker.* • *Session 6 interaction and presentations from the Adelaide University project on hybrid vigour.*

	• Unintended benefits or consequences are that there will be more R&D projects linked to extension and producer groups so that outputs can be readily adopted. Also, an improvement in animal health and welfare and adoption of pain-relief during animal husbandry procedures.	• Greater demand and provision of specialist beef livestock consultancy services.	• *Session 8 interaction and presentations from The University of Adelaide's Heifer development project and Herd inventory management strategies project (Wayne Pitchford and Darren Koopman).* • *The group was exposed to specialist beef livestock consultancy services involved in the project: Elke Hocking Consulting, T.Prance Rural Consulting, Sean McGrath – vet and consultant Millicent Veterinary clinic, along with guest presenters Andrew Whale – Livestock Logic and Penny Schulz (Schulz Livestock). Sean, Tim and Elke are present at every session. More recently, Ash Hunt (Tailored Consulting Services), a private nutrition consultant is going to be involved in one-on-one coaching sessions with producers to assist with data collection and also check on how well the monitor mob's nutritional requirements are being met.* • *An increasing number of producers within the group are now using Sean McGrath within their business to develop yearly animal health plans for their beef enterprises (and in some cases for their sheep enterprises). Some producers are using Tim Prance for advice on pastures, and it is hoped that a number will also start using Ash Hunt for provision of nutritional advice.*

		• Project learnings, barriers / enablers to adoption will be reported on in the final report/	• *Sean McGrath has commenced Heifers for Profit producer workshops in the region as a result of promotions and communications from this project (including word of mouth referrals from within the project participants to other producers).* • *Barriers to adoption – need sufficient time to see changes in beef herds due to the long generation interval. Individual management is not seen as a priority as visual assessment and mob-based data seems to be sufficient and the extra time and skills required for individual management and data analysis is seen as not being a good return on investment for time.* • *Enablers of adoption – open and transparent discussion group, built on trust and sharing of the good, bad and the ugly. Supported learning environment with access to researchers, technical experts, and veterinarians. This leads to learning and support within and outside the group.*